ENGINEERING INVESTIGATIONS AT INACTIVE HAZARDOUS WASTE SITES

PHASE I INVESTIGATION

64TH STREET SOUTH, SITE NUMBER 932085
CITY OF NIAGARA FALLS, NIAGARA COUNTY

September 1989

Prepared for:

New York State Department of Environmental Conservation

50 Wolf Road, Albany, New York 12233
Thomas C. Jorling, Commissioner

Division of Hazardous Waste Remediation
Michael J. O'Toole, Jr., P.E., Director

Prepared by:

Ecology and Environment Engineering, P.C.

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TABLE OF CONTENTS

Table of Contents (Cont.)

LIST OF ILLUSTRATIONS

LIST OF TABLES

1

1. EXECUTIVE SUMMARY

1.1 SITE BACKGROUND

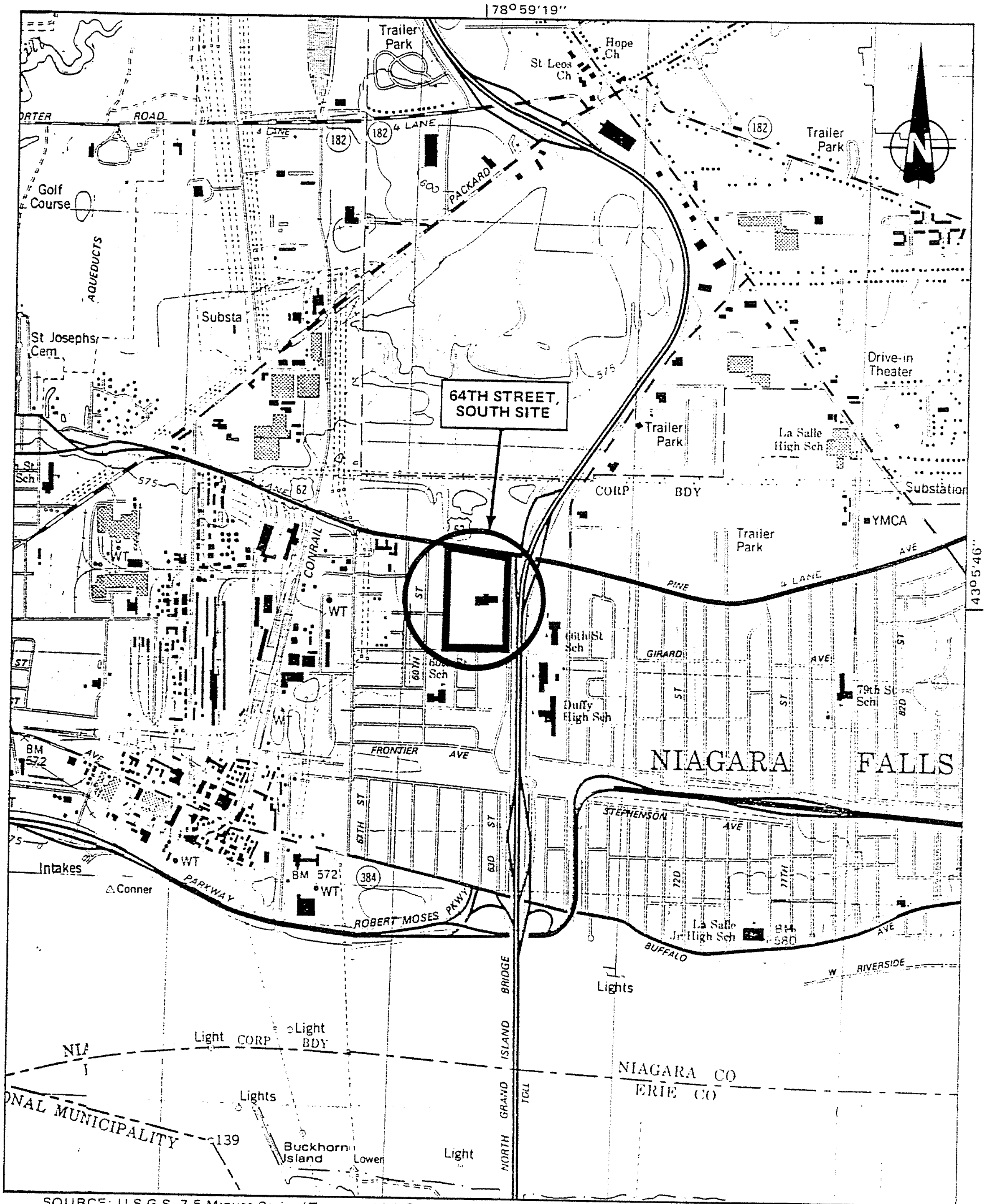
The 64th Street South site is bound by Girard Avenue to the south, 61st Street to the west, Niagara Falls Boulevard (Route 62) to the north, and Chevy Place to the east. The site was used as a landfill during the 1950s and possibly the early 1960s. The operator of the landfill is not known. Although domestic waste is believed to be the principal material that was disposed in the landfill, some industrial dumping did occur, as evidenced by the presence of slag on the surface.

At present, the majority of this 10-acre site is owned by Sam Russo and Russo Chevrolet. Much of the lot is open and covered with grass and shrubs. Also located on the property are several houses, an auto-leasing firm, two motels, and a gas station.

Extensive soil and water sampling as well as hydrogeological investigations have been performed by NUS Corporation (NUS) under contract to the United States Environmental Protection Agency (EPA) and, to a lesser extent, the United States Geological Survey (USGS). Interpretation of groundwater data must take into account the presence of hazardous waste landfills directly to the north and upgradient (CECOS International and Dupont-Necco Park).

1.2 PHASE 1 EFFORTS

Primary sources of information for this report were the files of the Niagara County Department of Health, New York State Department of Environmental Conservation (NYSDEC) Region 9 offices, and the EPA Public Information Office, Niagara Falls, New York. Ecology and



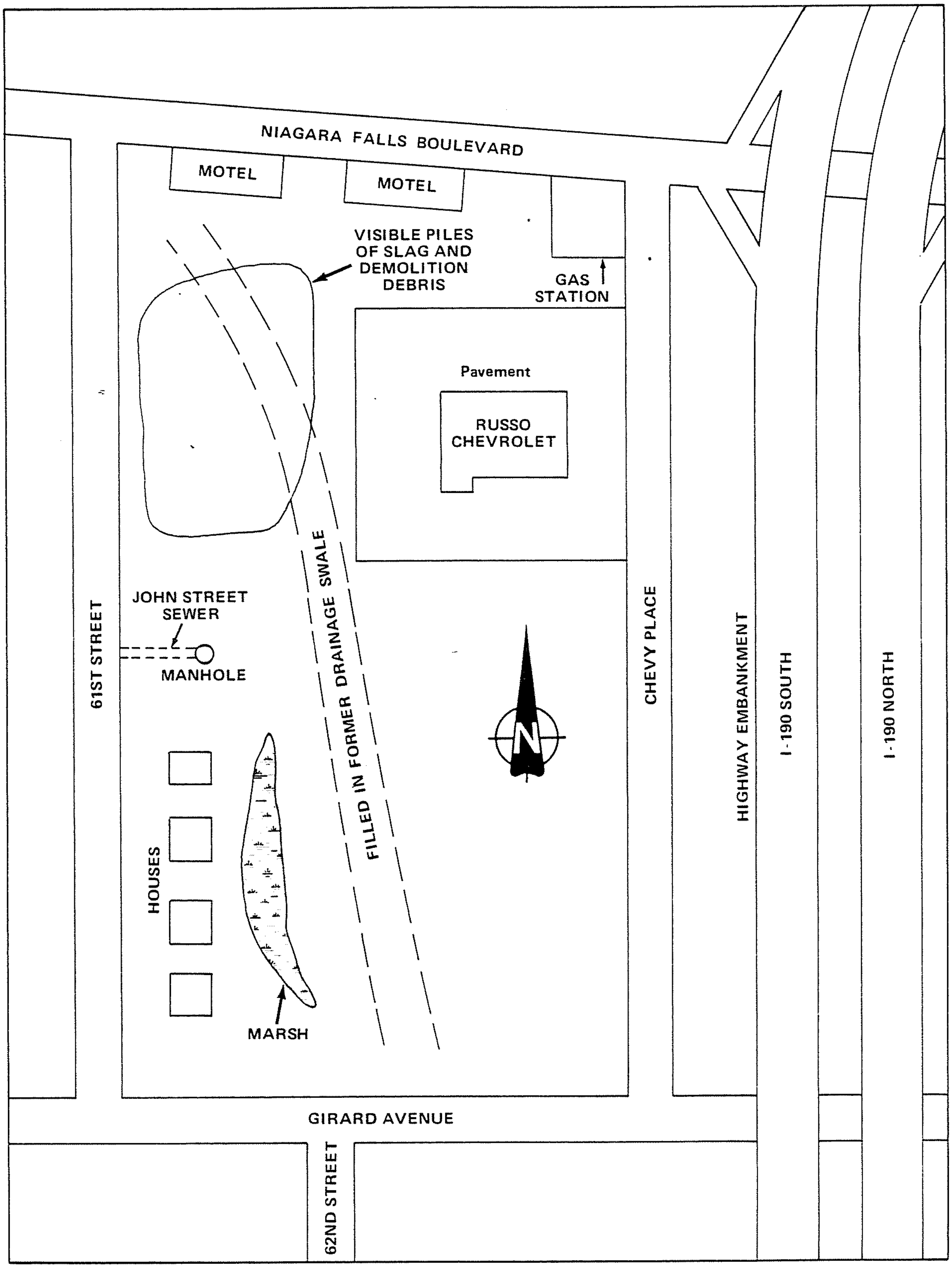
SOURCE: U.S.G.S. 7.5 Minute Series (Topographic) Quadrangles, Niagara Falls, N.Y.–Ont., 1980; Tonawanda West, N.Y., 1980.

SCALE

0 ½ 1 MILE

0 .5 1 KILOMETER

Figure 1—1 LOCATION MAP



NOT TO SCALE

Figure 1—2 SITE MAP - 64TH STREET, SOUTH

Environment, Inc. (E & E), also conducted a site visit on June 12, 1987.

1.3 SITE ASSESSMENT

The 64th Street South site is a partially developed but mostly vacant lot in a residential area of Niagara Falls. EPA contractors have collected sufficient data to make an assessment of public and environmental hazards posed by this site. Trace amounts of priority pollutants were found in soil samples collected from this site, but an evaluation of the data by the New York State Department of Health (NYSDOH) concluded that the site posed negligible hazards to the public. Source groundwater contamination was detected in wells near the site, but hydrogeological investigations of the region by NUS indicated that these wells were upgradient of the site.

1.4 HAZARD RANKING SYSTEM SCORE

A preliminary application of the Hazard Ranking System (HRS) has been made to quantify the risk associated with this site. As the Phase I investigation is limited in scope, not all the information needed to fully evaluate the site is available. An HRS score was completed on the basis of the available data. Absence of necessary data may result in an unrealistically low HRS score.

Under the HRS, three numerical scores are computed to express the site's relative risk or damage to the population and the environment. The three scores are:

- S_M reflects the potential for harm to humans or the environment from migration of a hazardous substance away from the facility by routes involving groundwater, surface water, or air. It is a composite of separate scores for each of the three routes (S_{GW} = groundwater route score, S_{SW} = surface water route score, and S_A = air route score).

- S_{FE} reflects the potential for harm from substances that can explode or cause fires.

- o S_{DC} reflects the potential for harm from direct contact with hazardous substances at the facility (i.e., no migration need be involved).

The preliminary HRS score was:

S_M = 3.26 (S_{GW} = 4.97; S_{SW} = 2.66; S_A = 0)

S_{FE} = not scored

S_{DC} = 62.5

The negligible risks posed by this site are reflected in the low HRS score (S_M) of 3.26. The fire and explosion score (S_{FE}) was not scored as the site has not been designated a fire hazard by a fire marshal. The direct contact score (S_{DC}) was very high: 62.5. This is partially due to the fact that the site is open and accessible and is located in a residential area. More directly, however, the score is high because polycyclic aromatic hydrocarbon (PAH) compounds were detected in the soil at low concentrations (an average of approximately 15 ppm total PAHs, which is normal background for developed areas). The direct contact HRS scoring procedure does not, however, take concentration into account.

2

2. PURPOSE

This Phase I investigation was conducted under contract to the NYSDEC Superfund Program. The purpose of this investigation was to provide a preliminary evaluation of the potential environmental or public health hazards associated with past disposal activities at the 64th Street South site. This initial investigation consisted of a detailed file review of available information and a site inspection. This evaluation includes both a narrative description and preliminary HRS score. The investigation at this site focused on the section of the site landfilled during the 1950s and on evaluation of analytical results available from sampling conducted in 1985.

3

3. SCOPE OF WORK

The Phase I effort involved:

- The review of available information from state, municipal, and private files;
- Interviews with individuals knowledgeable of the site; and
- A physical inspection of the site.

State files reviewed were maintained by NYSDEC Region 9 in Buffalo, New York. County files reviewed were maintained by Niagara County Department of Health. Mr. Michael Hopkins of the Niagara County Health Department was contacted in person on May 1, 1987, to discuss information maintained in the county files. The county file on the facility contained a profile and inspection report prepared in 1986. A site inspection was conducted by E & E personnel on June 12, 1987. No samples were collected by E & E, although monitoring of air quality was performed using an HNu photoionizing organic vapor detector. A physical inspection of the site and review of pertinent USGS 7.5-minute topographic maps were completed. Photographs were taken during the site inspection; the photographic record is included as Appendix A.

A summary of agencies contacted, along with contact persons and addresses is presented in Table 3-1.

Table 3-1

SOURCES CONTACTED FOR THE PHASE I INVESTIGATION
AT THE 64TH STREET SOUTH SITE

- New York State Department of Environmental Conservation, Region 9
  600 Delaware Avenue, Buffalo, New York 14202
  Telephone Number: (716) 847-4585

  - Division of Solid Hazardous Waste
    Contact: Lawrence Clare, Ahmed Tayyebi;
    Date Contacted: May 8, 1987
    Information: Reports; correspondence; analytical results.

  - Division of Regulatory Affairs
    Contact: Paul Eismann
    Date Contacted: May 8, 1987; June 2, 1987
    Information: Permits; wetlands information.

  - Division of Environmental Enforcement
    Contact: Joann Gould
    Date Contacted: May 6, 1987
    Information: Enforcement actions.

  - Division of Water
    Contact: Rebecca Anderson
    Date Contacted: June 2, 1987
    Information: Floodplain locations.

  - Bureau of Wildlife
    Contact: James R. Snider
    Date Contacted: June 2, 1987
    Information: Critical habitat locations.

- New York State Department of Health
  Corning Tower
  The Governor Nelson A. Rockefeller Empire State Plaza
  Albany, New York 12237
  Telephone: (518) 458-6310
  Contact: Lani Rafferty
  Date Contacted: April 5, 6, 1989
  Information: File search for site history, correspondence, background information.

- Niagara County Department of Health
  10th and E. Falls Street, Niagara Falls, New York 14302
  Telephone Number: (716) 284-3128
  Contact: Michael Hopkins, Paul Dicky
  Date Contacted: May 1, 1987; May 15, 1987; June 5, 1987; June 23, 1987
  Information: Site ownership and history; aerial photograph reviews; analytical results.

- U.S. Environmental Protection Agency Public Information Office
  345 Third Street, Suite 530, Niagara Falls, New York 14303
  Telephone Number: (716) 285-8842
  Date Contacted: June 23, 1987
  Information: Analytical results; geologic information.

- City of Niagara Falls Utilities Department, Division of Water
  Buffalo Avenue and 53rd Street, Niagara Falls, New York
  Telephone Number: (716) 278-8248
  Date Contacted: June 15, 1987
  Information: Well water usage.

- Town of Niagara Water Department
  7105 Lockport Road, Niagara Falls, New York
  Telephone Number: (716) 297-2150
  Contact: Dean Brown
  Date Contacted: June 15, 1987
  Information: Well water usage.

Table 3-1 (Cont.)

- o New York State Department of Health
  Regional Toxic Program Office
  584 Delaware Avenue
  Buffalo, New York 14202
  Contact: Linda Rusin, Cameron O'Connor
  Telephone No.: 716-847-4365
  Dates Contacted: May 5 and June 4, 1987; and April 13, 1989
  Information: Contact with NYSDOH on May 5, 1987, indicated that files were being transferred from Albany to Buffalo so the files were not accessible. Further corespondence in June 1987 indicates that the office was newly established and file information was extremely limited; therefore, the county health departments were visited in lieu of NYSDOH. NYSDOH files were searched April 13, 1989.

4

4. SITE ASSESSMENT

4.1 SITE HISTORY

Prior to 1950, the 64th Street South site was farmland. At that time, a drainage swale cut diagonally across the site from the northwest corner to the southeast corner. During the 1950s and possibly the early 1960s, this swale was used as a landfill. The City of Niagara Falls may have operated the landfill (Dicky 1987).

A review of USDA aerial photographs from early 1939 by the Niagara County Health Department shows no evidence of dumping on this site at that time. A 1951 photo shows a portion of the swale immediately south of Niagara Falls Boulevard to be filled. A 1958 photo shows the entire length of the swale filled in. Additional suspected fill areas occur north of the swale in the area between what is now 61st Street and Chevy Place. A 1966 photo indicated that the area appeared to have been leveled and covered with grass (Dicky 1987).

Household wastes are expected to comprise the majority of the disposed substances; however, some industrial dumping occurred. Slag was visible during a site inspection conducted by E & E on June 12, 1987.

At present, the majority of the site is owned by Sam Russo and Russo Chevrolet (Dicky 1987). Much of the site is open and covered with grass and shrubs. There are 4 two-family homes located on the southwest portion of the site. Motels and a gas station are located along the northern edge of the property. Prior to the construction of the Chevy dealership, the open area was used annually by the Barnum and Bailey Circus (Russo 1987).

4.2 SITE TOPOGRAPHY

The 64th Street South site is located southwest of the intersection of Interstate 190 and Niagara Falls Boulevard in the City of Niagara Falls. The regional area, a lacustrine plain, is essentially flat at an elevation of 570 feet. The site is 0.75 mile north of the Niagara River and 1.5 miles west of Cayuga Creek which flows south into the Niagara River. The underground water conduits of the Power Authority of the State of New York lie just over 1 mile to the west. A NYSDEC-designated wetland (No. TW-3) is located 0.5 mile to the northeast.

Although the immediate surroundings of the site are residential, a large industrial area lies 0.5 mile to the west. The CECOS hazardous waste landfill is located 0.5 mile to the north.

Although the site is largely vacant, several residences and businesses are located on the property. Four townhouses are located in the southwest corner along 61st Street. An auto leasing firm is also located along 61st Street. Motels and a gas station are along Niagara Falls Boulevard and the Russo Chevrolet dealership is on Chevy Place.

4.3 SITE HYDROLOGY

4.3.1 Regional Geology and Hydrology

The geology of the Niagara Falls area is well understood because of its simplicity and because of the excellent exposures of bedrock along the Niagara River gorge and the Niagara escarpment.

The overburden in the Niagara Falls area is relatively thin. Three types of these unconsolidated deposits are present. The lowermost is glacial till and regolith, an unsorted mixture of boulders, clay, and sand deposited by glaciers, which directly overlies the bedrock. This is covered by clays, silts, and fine sands of lacustrine origin. These are the surface soils throughout most of the region. In isolated spots, sand and gravel deposits are found above the lacustrine soils. These were deposited by glacial melt streams and by wave action of the larger ancestors of the Great Lakes.

The bedrock in the Niagara Falls area consists of nearly flat-lying sedimentary rocks, including dolomite, shale, limestone, and sandstone units. The several beds of bedrock slope southward approximately 30 feet per mile.

The entire region south of the Niagara escarpment, and extending almost to Erie County, is directly underlain by the Lockport Dolomite. The Clinton and Albion groups underlie the Lockport but crop out only along the escarpment and in the gorge of the Niagara River. These units are underlain by the Queenston shale. This unit is the uppermost bedrock unit under the plain north of the escarpment.

Groundwater in the Niagara Falls area occurs in both the unconsolidated deposits and in the bedrock. The bedrock, specifically the Lockport Dolomite, is, however, the principal source of groundwater in the Niagara Falls area. Three types of bedrock openings contain groundwater: bedding joints, vertical joints, and solution cavities.

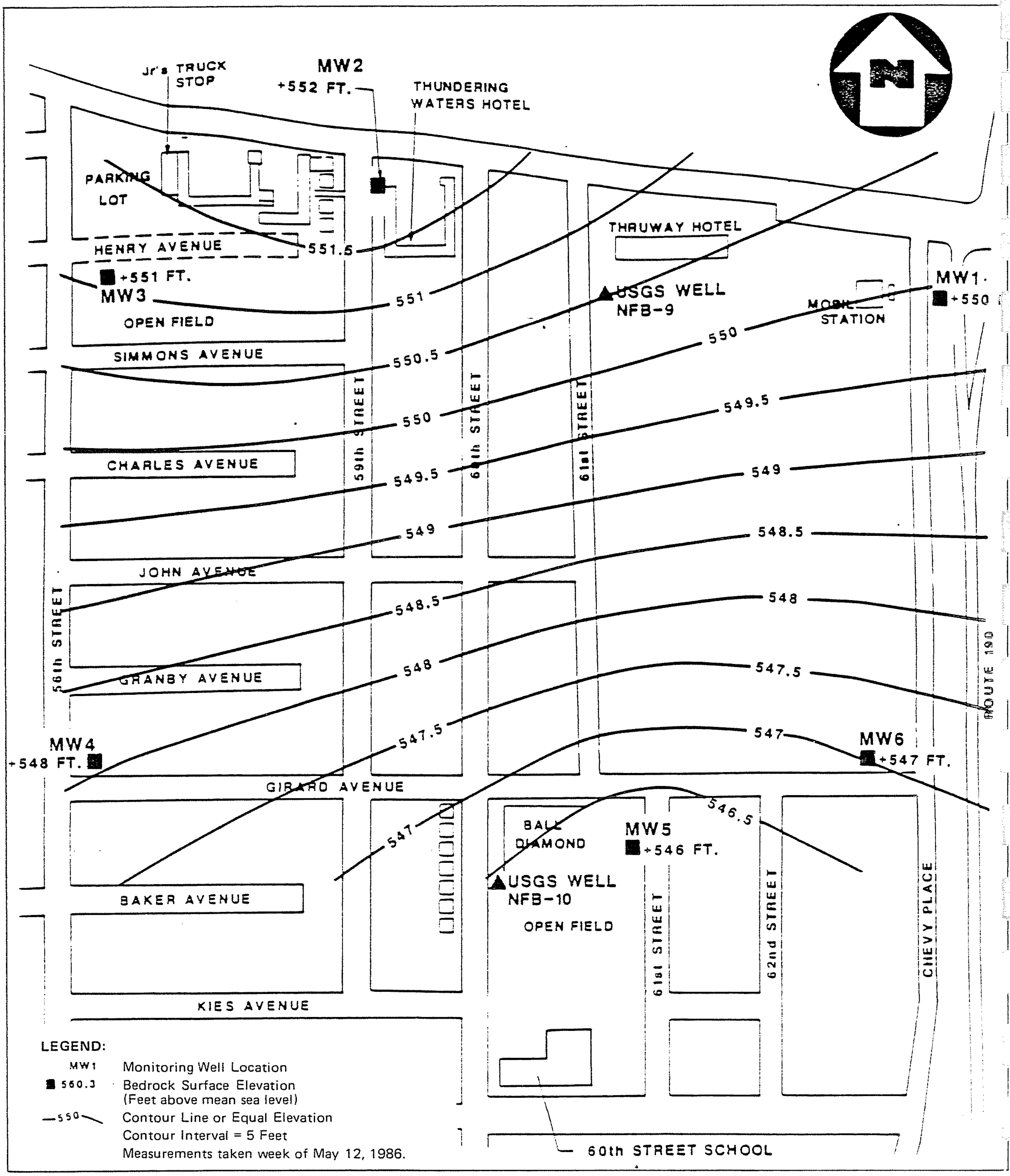
The bedding joints, which transmit most of the water in the Lockport, are fractures along prominent bedding planes which have been widened up to 1/8 inch by solution of the rocks. These joints extend several miles thus constituting effective water conduits.

The vertical joints are generally too short and sparse to account for significant groundwater storage and transmission, except in the top 10-25 feet of bedrock. Solution cavities, formed when gypsum is dissolved, are also not important components of the aquifer. Although they increase the storage capacity of the aquifer, they are isolated and do not contribute to groundwater transmission.

Two distinct sets of groundwater conditions exist in the Lockport Dolomite. The first is the upper 10 to 25 feet of the bedrock. This region is highly fractured resulting in moderate permeabilities. In some areas in the region, a confining layer of clay above this zone can produce artesian groundwater conditions. The second class of groundwater conditions is found deeper in the bedrock, where at least seven different permeable zones have been identified. These zones are surrounded by impermeable bedrock and it is not likely that they are hydraulically connected (Johnston 1964).

4.3.2 Site Hydrogeology

The geology and hydrogeology of this site is known in considerable detail from the many test borings and monitoring wells installed by NUS for the EPA in 1985 and 1986. NUS installed well clusters at six locations on or near the 64th Street South site (see Figure 4-1). One borehole at each cluster was continuously split-spoon sampled



SOURCE: NUS 1986

Figure 4—1 TOP OF BEDROCK CONTOUR MAP

through the overburden to the bedrock surface or a surface of refusal. Two borings at each well cluster were intended to be bedrock monitoring wells and these were continuously rock cored to their respective target depths.

A Lockport Dolomite bedrock surface contour map is shown in Figure 4-1. The erosion surface of the bedrock was encountered between 21 and 27 feet below the surface. It slopes gently to the south dropping in elevation from three to four feet over a distance of 1,300 to 1,400 feet.

The bedrock is overlain by several units of unconsolidated glacial deposits, as discussed in Section 4.3.1. A generalized cross section of these deposits is shown in Figure 4-2. The glacial till and regolith unit contains large blocks of dolomite quarried by glaciers and was found to be quite variable in thickness. Lacustrine clay, silt, and fine sand deposits overlie the till. No fluvial deposits are present. The fill that covers the surface of the site is the subject of this investigation.

The hydrology of the site is a complex system involving the overburden and the bedrock. NUS investigated the water-bearing capacities of two sections of the overburden and two fracture zones in the bedrock.

Several wells were installed to monitor shallow underground water conditions found above the lacustrine clay sequence. A computer-generated potentiometric contour map (see Figure 4-3) indicates flow to be moving northwesterly. The flows indicated on this map may be oversimplified and may be impacted by manmade disruptions such as a sewer that runs under John Avenue west of the site and extends onto the site.

Several wells were installed into the regolith zone to monitor conditions at the overburden bedrock interface. A computer generated groundwater potentiometric contour map (see Figure 4-4) indicates water to be flowing in a southwestern direction. Again, the construction of the John Avenue sewer (installed in the regolith) may be exerting a significant influence on the groundwater flow in this region.

Lastly, NUS installed several wells in two separate fracture zones in the Lockport Dolomite. The first (uppermost) fracture zone was drilled within the upper 10 to 15 feet of bedrock. This section contained abundant vertical fractures in addition to the horizontal

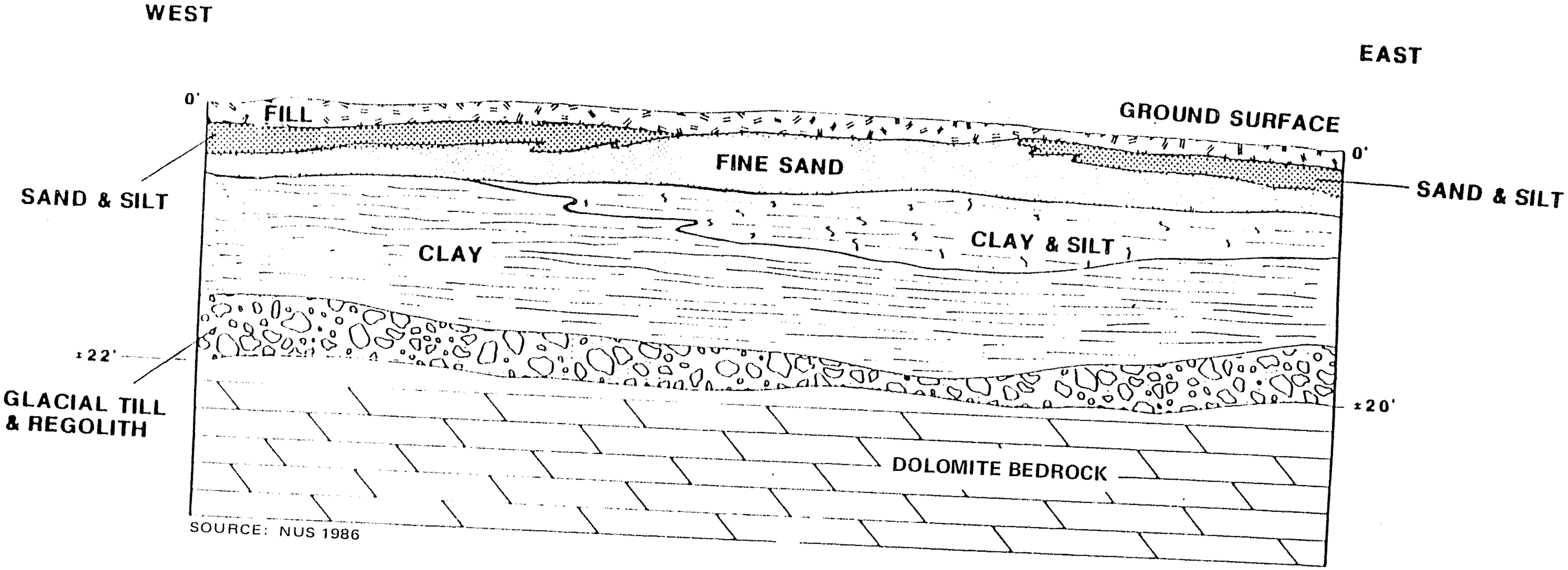
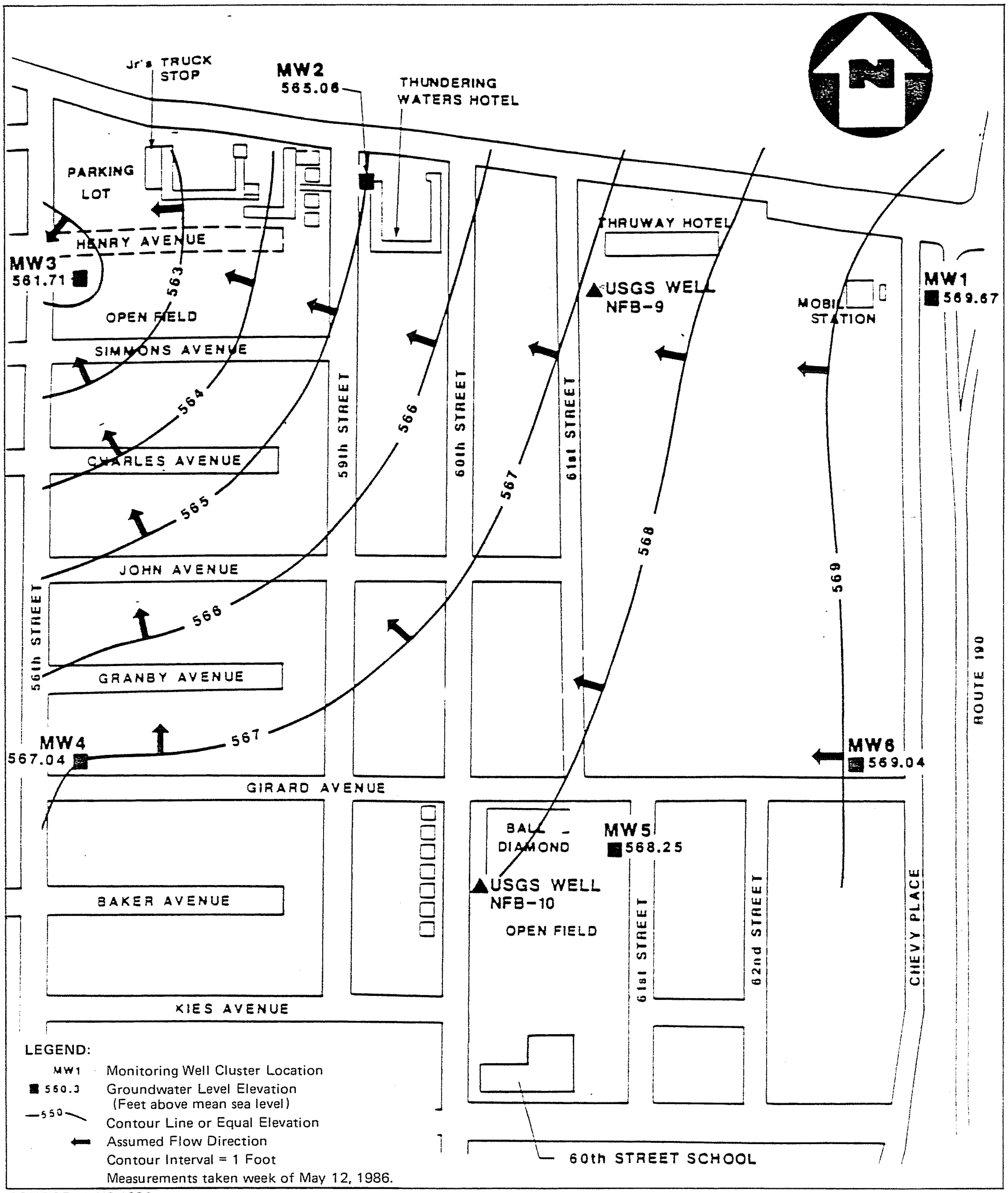


Figure 4–2 GENERALIZED CROSS-SECTION OF SOIL AND BEDROCK STRATIGRAPHY



SOURCE: NUS 1986

Figure 4—3 POTENTIOMETRIC SURFACE CONTOUR MAP FOR SHALLOW WATER WELLS bedding fractures. A computer-generated potentiometric contour map for the wells in this fracture zone (see Figure 4-5) shows a similar trend as that which is developed in the regolith well contour map (see Figure 4-4)--groundwater flow in a southwesterly direction. A hydraulic connection between the regolith and upper fracture zone is possible due to the densely fractured nature of the bedrock surface and the high degree of fracturing in the dolomite bedrock.

NUS installed several more wells in a lower fracture zone. This fracture zone existed at an average of 50 feet below the surface of the bedrock. A computer-generated potentiometric contour map for these wells (see Figure 4-6) shows a westward direction of water flow. This pattern is different from the pattern developed for the upper fracture zone wells, possibly indicating the hydrologic uniqueness of the lower fracture zone. This westward flow may indicate influence from the New York Power Authority conduits, 1 mile to the west.

4.3.3 Hydraulic Connections

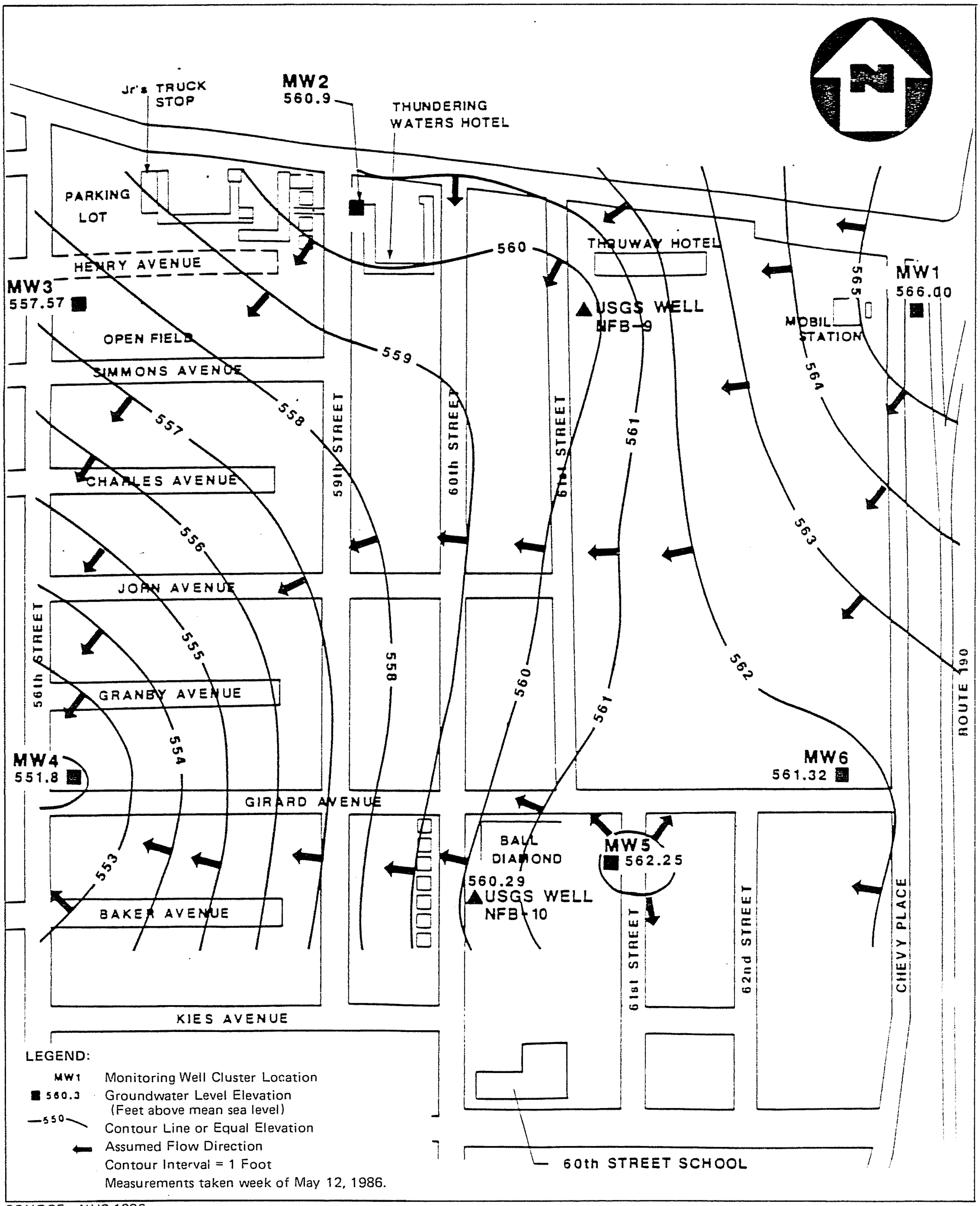
As discussed in the previous section, NUS determined that at least four distinct aquifers exist beneath this site. NUS examined two aquifers in the overburden and two in the Lockport Dolomite bedrock. No definite conclusions with regard to hydraulic connections were made. Certain assumptions can be made, however, from the data (NUS 1986).

Due to the presence of a thick layer of clay above the regolith, the shallow water aquifer is probably not connected to deeper aquifers. This assumption is supported by different directions of flow of the shallow water (northwest) and the regolith aquifer (southwest).

The regolith aquifer may, however, be hydraulically connected to the uppermost bedrock fracture zone aquifer. This assumption is supported by similar flow directions of the two aquifers and the densely fractured nature of the upper region of bedrock.

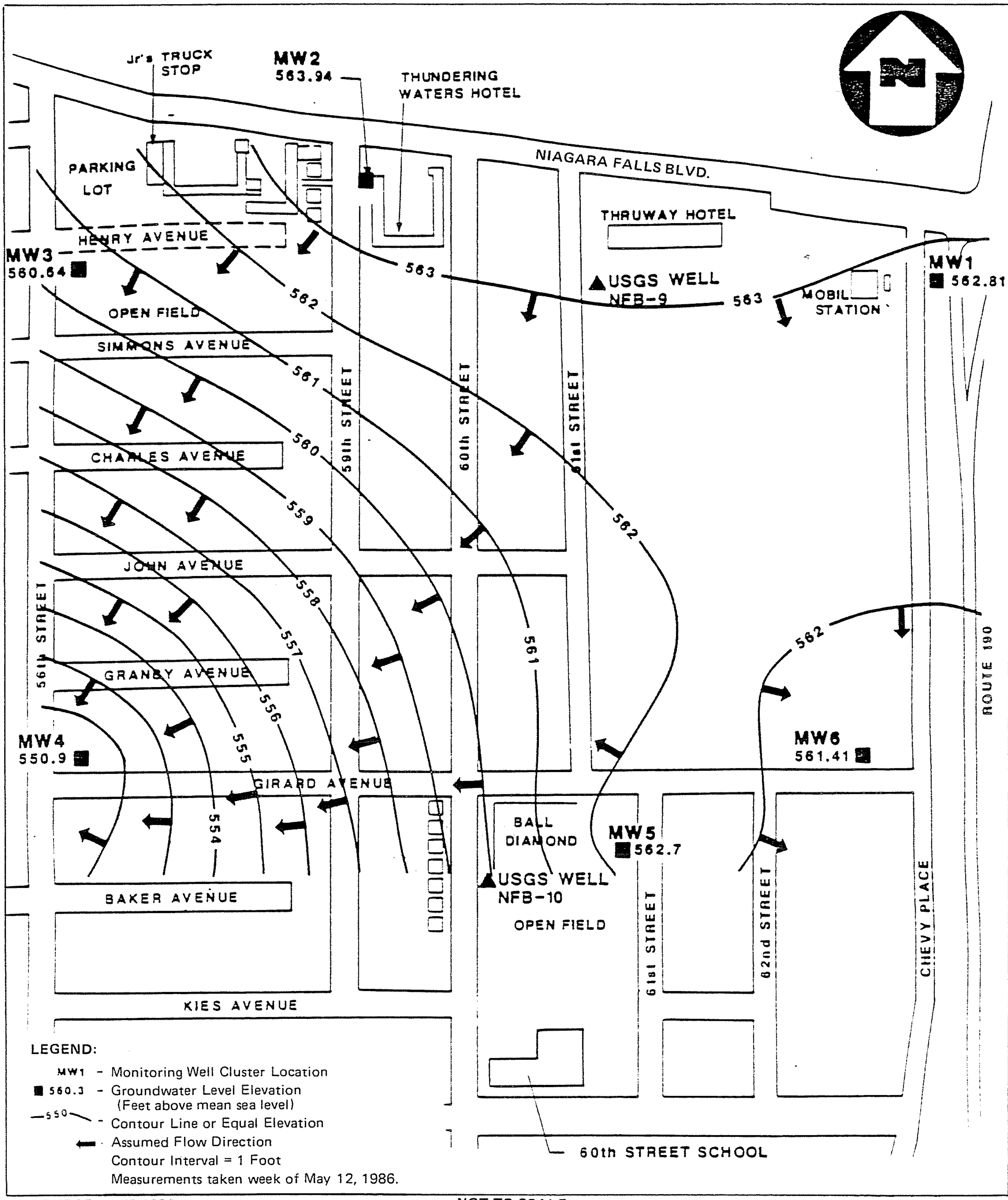
NUS suggests further that the lower bedrock fracture zone aquifer may be distinct from the upper fracture zone aquifer. This assumption is based on slightly different flow directions of these two aquifers.

Measurement of the contamination of the aquifer also suggests possible connections or barriers between aquifers. The most significant contamination found was in NUS's well cluster Number 2, located



SOURCE: NUS 1986

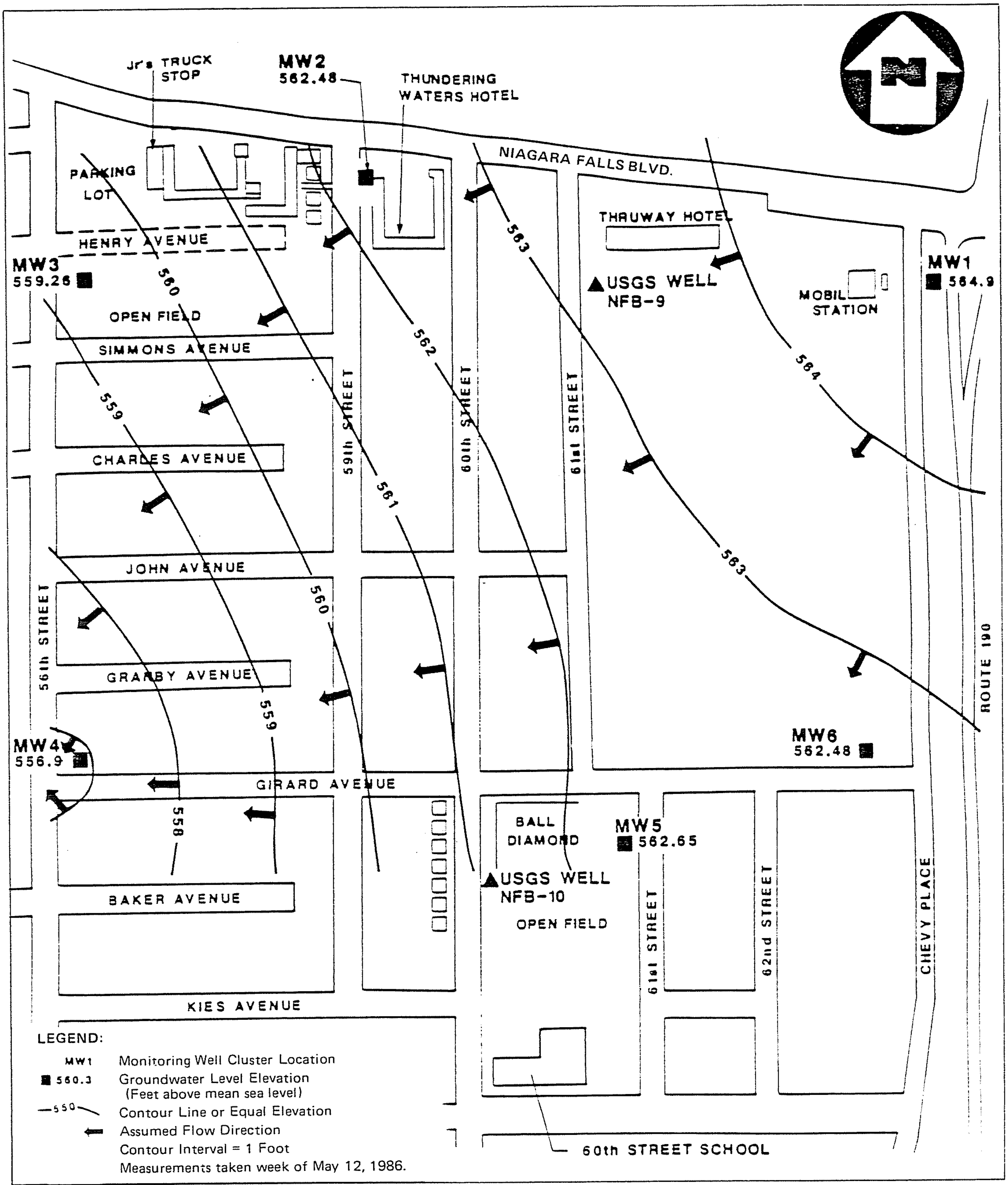
Figure 4–4 POTENTIOMETRIC SURFACE CONTOUR MAP FOR REGOLITH WELLS



SOURCE: NUS 1986

NOT TO SCALE

Figure 4—5 POTENTIOMETRIC SURFACE CONTOUR MAP FOR UPPER FRACTURE ZONE WELLS



SOURCE: NUS 1986

NOT TO SCALE

Figure 4—6 POTENTIOMETRIC SURFACE CONTOUR MAP FOR LOWER FRACTURE ZONE WELLS two blocks west of the northwest corner of the site, along Niagara Falls Boulevard. Contamination was found at this location on several separate occasions, but only in the regolith and upper fracture zone aquifers. The lack of contamination in the shallow water wells and lower fracture zone wells suggests that the lacustrine clay and unfractured bedrock, respectively, are effective barriers to vertical migration of contaminants in the vicinity of the 64th Street South site. The extent and evaluation of this contamination is discussed in the next section.

4.4 SITE CONTAMINATION

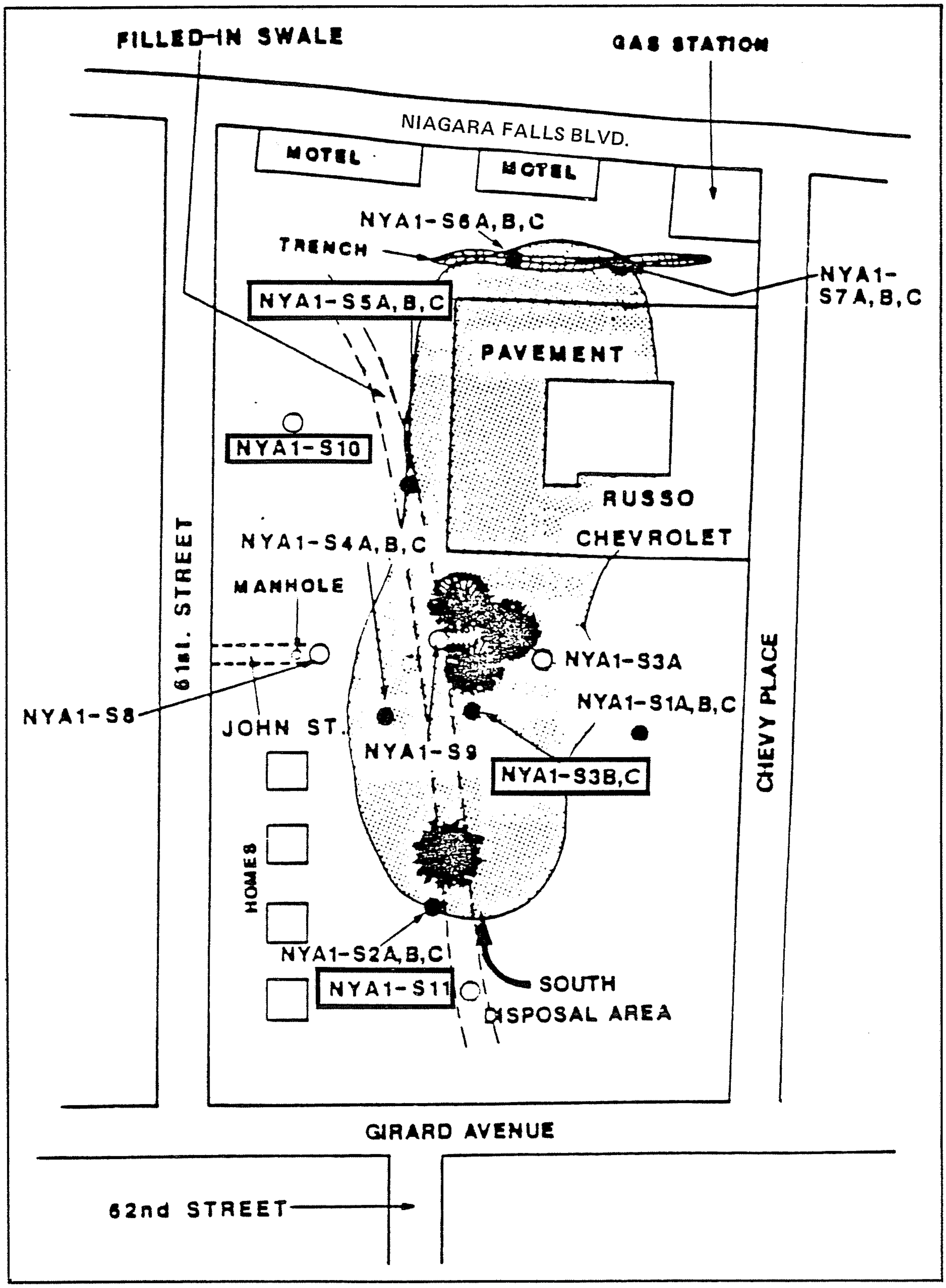
Only limited information about the actual operation of the 64th Street South landfill is available. Thus it is possible that unregulated waste disposal occurred at this site. The presence of observable slag confirms that some industrial dumping occurred at this site.

NUS conducted extensive soil sampling on this site. Twenty-five samples were taken at locations selected following a magnetometer survey conducted on the day preceding the sampling. Samples were taken at depths of 0, 2, and 5 feet.

Some contamination was found, principally in the surface samples. The contaminants were mainly polycyclic aromatic hydrocarbons (PAHs), approximately 2 ppm or less, except for one sample taken from a trench between Russo Chevrolet and the gas station at the corner of Niagara Falls Boulevard and Chevy Place, in which PAH species concentrations ranged up to 61 ppm. A second sample taken from the trench approximately 75 yards to the west did not contain high PAH concentrations (<1 ppm). Trace amounts (up to 2.5 ppm) of bis (2-ethylhexyl) phthalate were found in the location shown on Figure 4-7. Some pesticides, ranging in concentrations from trace to 0.33 ppm were detected along the northern, western, and southern boundaries of the site.

An additional 24 samples were collected by NUS during the installation of the monitoring wells on or near the site (as discussed in Section 4.3.2). The only organic compound detected in these samples was toluene. At the well sites directly on or adjacent to the 64th Street South site, the toluene concentration was 20 ppb or less.

NUS conducted extensive groundwater sampling in the vicinity of the site. In addition to sampling two existing USGS wells (installed



KEY:

Former Disposal Area ○ Surface Soil Sample Locations ● Multi-depth Soil Sample Locations **NYA** bis 2-ethylhexyl phthalate Hot Spots

Figure 4–7 SAMPLE LOCATION MAP – 64TH STREET DUMP, NIAGARA FALLS, NEW YORK in 1982), NUS installed 25 wells in 1985. Figure 4-1 indicates the location of these wells.

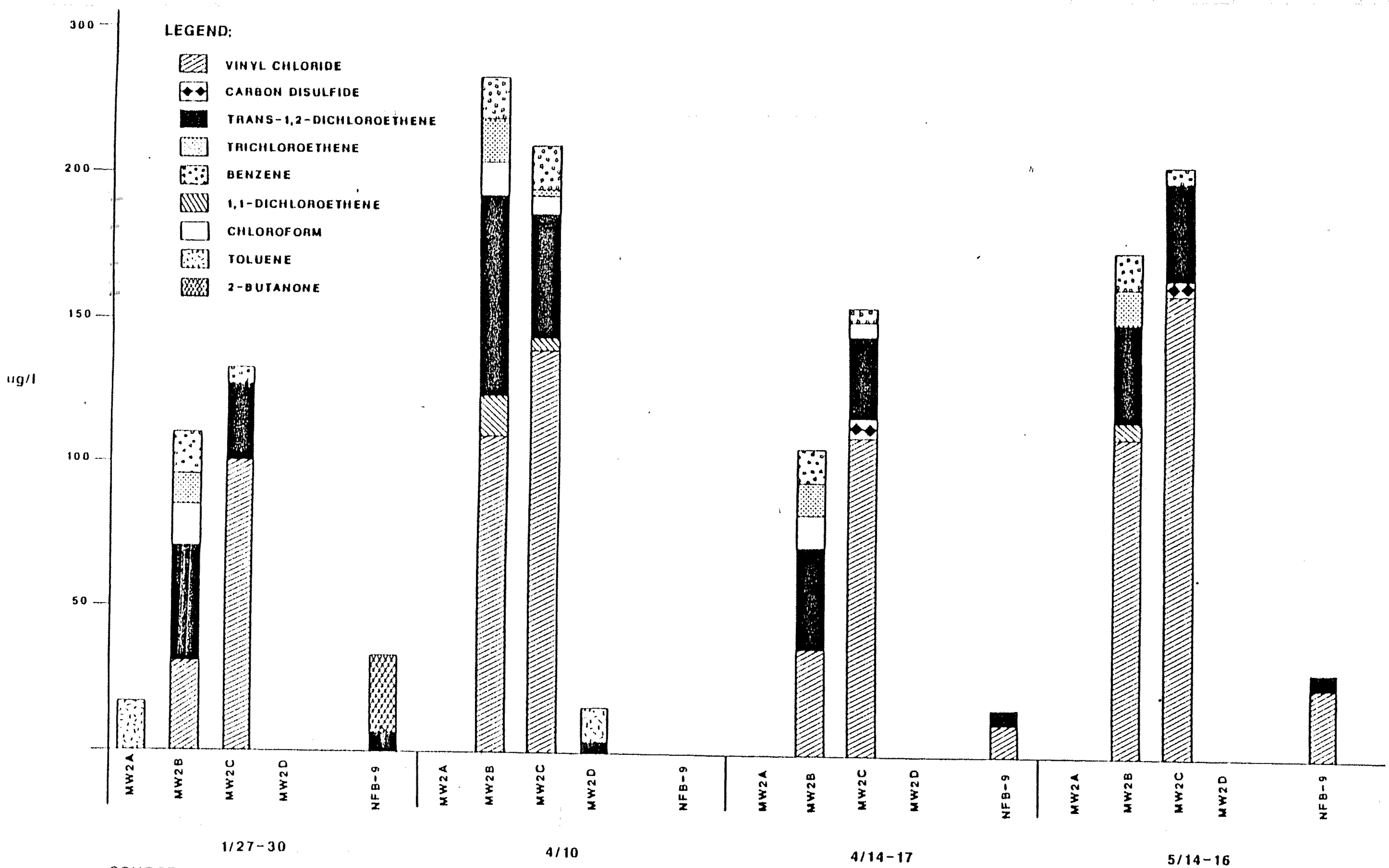
NUS sampled some or all of these wells in January, April, and May of 1986. Measurable organic contamination existed only in the regolith and upper fracture zone wells at well cluster 2 (750 feet west of the northwest corner of the site, along Niagara Falls Boulevard), and in the USGS well (in the regolith) of the northwest corner of the site. The principal contaminants found were vinyl chloride, dichloroethene, chloroform, trichloroethene, benzene, and cyanide. A graphic summary of the data, except cyanide, is given in Figure 4-8. In this figure, MW2A, MW2B, MW2C, and MW2D are the shallow water, regolith, upper fracture zone, and lower fracture zone wells at cluster location 2, respectively. NFB-9 is the USGS well on the site.

The soil sample data has been reviewed by the New York State Department of Health (Hawley 1985) and the groundwater sample data by the U.S. Department of Health and Human Services, Public Health Service (Nelson 1986).

John Hawley of the New York State Department of Health attributes the elevated PAH concentrations in the soil to paving operations, and indicated these levels are no higher than would be found in any developed area. The amount of bis (2-ethylhexyl) phthalate found in several samples was expected to be limited to one additional cancer per billion people, and was thus judged to pose negligible risks. The pesticides found on site were also below levels that would represent a health hazard. Hawley's initial overall assessment of this site is that it does not constitute a health hazard from short-term or continued exposure to the site. He recommends, however, that children younger than 3 years of age (based on a criteria of ingestion of dirt while playing) be kept from the area, although he does not recommend fencing the area.

William Nelson of the Department of Health and Human Services was concerned about the high levels of cyanide and vinyl chloride in the regolith/upper fracture zone aquifers. As the water is not used as a drinking water source, however, he concluded that no immediate public health threat exists.

The flow pattern of the regolith and upper bedrock aquifers at the contaminated wells is principally to the south. Since these wells



SOURCE: NUS 1986

Figure 4–8 CONTAMINANTS FOUND IN MONITORING WELLS NEAR THE 64TH STREET, SOUTH SITE are located 750 feet west of the northwest corner of the site, it is not reasonable to attribute the contamination to the 64th Street South site.

5

5. PRELIMINARY APPLICATION OF THE HRS

5.1 NARRATIVE SUMMARY

The 64th Street South site covers 10 acres and is located southwest of the intersection of Interstate 190 and Niagara Falls Boulevard in the City of Niagara Falls (see Figure 5-1). The regional area, a lacustrine plain, is essentially flat at an elevation of 570 feet. The site is 0.75 mile north of the Niagara River and 1.5 miles west of Cayuga Creek which flows south into the Niagara River. The underground water conduits of the Power Authority of the State of New York lie just over 1 mile to the west. A NYSDEC-designated wetland (No. TW-3) is located 0.5 mile to the northeast.

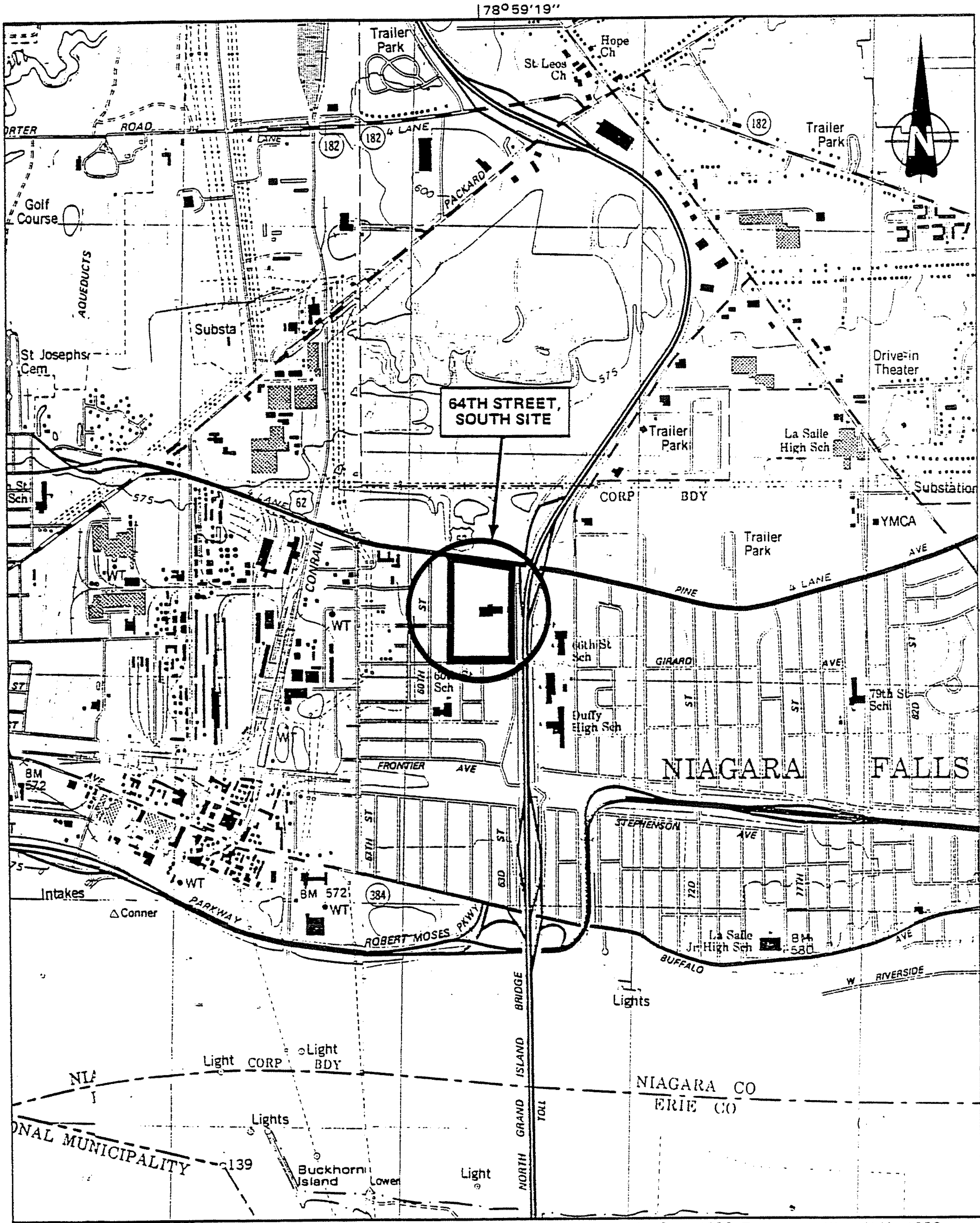
Although the immediate surroundings of the site are residential, a large industrial area lies 0.5 mile to the west. The CECOS hazardous waste landfill is located 0.5 mile to the north.

The site is largely vacant; however, several residences and businesses are located on the property. Four townhouses are located in the southwest corner along 61st Street. An auto leasing firm is also located along 61st Street. Motels and a gas station are along Niagara Falls Boulevard and the Russo Chevrolet dealership is on Chevy Place.

Landfilling operations, without any documented authorization, occurred on this site during the 1950s. No information is available concerning the nature of fill dumped on the site. Although domestic wastes are assumed to be the major waste constituents, the presence of slag on the site confirms that some industrial dumping occurred.

According to soil and groundwater sampling by NUS, the soil is contaminated by pesticides, PAHs, and phthalates at low levels. According to NYSDOH, the levels do not pose a public health hazard.

An HRS score has previously been computed by NUS (NUS 1985). This much higher score (S_M = 22.01, S_{FE} = 43.75, S_{DC} = 50) was incorrect due to two errors in scoring. First, the amount of contaminated soil was entered as the total waste quantity, contrary to HRS scoring instructions (140 CFR, Section 300, Appendix A). Second, the City of Niagara Falls water intake was reported to be downstream from the site, while the Niagara Falls water supply is actually taken from an intake in the West (Chippawa) Channel of the Niagara River, not the East (Tonawanda) Channel near the 64th Street South site (Burmaster 1987).



SOURCE: U.S.G.S. 7.5 Minute Series (Topographic) Quadrangles, Niagara Falls, N.Y.–Ont., 1980; Tonawanda West, N.Y., 1980.

SCALE

0 ½ 1 MILE

0 .5 1 KILOMETER

Figure 5–1 LOCATION MAP

FIGURE 1

HRS COVER SHEET

Facility Name: 64th Street, South

Location: Chevy Place between Girard Ave. and Niagara Falls Blvd., Niagara Falls, NY

EPA Region: II

Person(s) in Charge of Facility: None. Property is owned by several independent landowners

Name of Reviewer: Jon Sundquist Date: June 25, 1987

General Description of the Facility:

(For example: landfill, surface impoundment, pile, container; types of hazardous substances; location of the facility; contamination route of major concern; types of information needed for rating; agency action; etc.)

This lot, formerly farmland, was used as an unregulated dump in the 1950's. Domestic and Commercial wastes are suspected to be the principal wastes, although slag was present on the site. Other industrial wastes may have been disposed of here. The site is located in a residential area, and some houses are built on the lot. Trace quantities of some PAH's and metals were found in the soil.

Scores: S_M = 5.40 (S_{gw} = 8.95 S_{sw} = 2.66 S_a = 0)

S_{FE} = 1.46

S_{DC} = 62.5

Ground Water Route Work Sheet					
Rating Factor	Assigned Value (Circle One)	Multi-plier	Score	Max. Score	Ref. (Section)
[1] Observed Release	0 45	1	0	45	3.1
If observed release is given a score of 45, proceed to line [4]. If observed release is given a score of 0, proceed to line [2].					
[2] Route Characteristics					3.2
Depth to Aquifer of Concern	0 1 2 (3)	2	6	6	
Net Precipitation	0 (1) 2 3	1	1	3	
Permeability of the Unsaturated Zone	0 1 (2) 3	1	2	3	
Physical State	(0) 1 2 3	1	0	3	
	Total Route Characteristics Score		9	15	
[3] Containment	0 1 2 (3)	1	3	3	3.3
[4] Waste Characteristics					3.4
Toxicity/Persistence	0 3 6 9 12 15 (18)	1	18	18	
Hazardous Waste Quantity	0 (1) 2 3 4 5 6 7 8	1	1	8	
	Total Waste Characteristics Score		19	26	
[5] Targets					3.5
Ground Water Use	0 1 (2) 3	3	6	9	
Distance to Nearest Well/Population Served	0 (4) 6 8 10 / 12 16 18 20 / 24 30 32 35 40	1	4	40	
	Total Targets Score		10	49	
[6] If line [1] is 45, multiply [1] x [4] x [5]; If line [1] is 0, multiply [2] x [3] x [4] x [5]			5,130	57,330	
[7] Divide line [6] by 57,330 and multiply by 100	S_{gw} = 8.95				

FIGURE 2
GROUND WATER ROUTE WORK SHEET

Surface Water Route Work Sheet					
Rating Factor	Assigned Value (Circle One)	Multi-plier	Score	Max. Score	Ref. (Section)
[1] Observed Release	(0) 45	1	0	45	4.1
If observed release is given a value of 45, proceed to line [4]. If observed release is given a value of 0, proceed to line [2].					
[2] Route Characteristics					4.2
Facility Slope and Intervening Terrain	(0) 1 2 3	1	0	3	
1-yr. 24-hr. Rainfall	0 1 (2) 3	1	2	3	
Distance to Nearest Surface Water	0 1 (2) 3	2	4	6	
Physical State	(0) 1 2 3	1	0	3	
	Total Route Characteristics Score		6	15	
[3] Containment	0 1 2 (3)	1	3	3	4.3
[4] Waste Characteristics					4.4
Toxicity/Persistence	0 3 6 9 12 15 (18)	1	18	18	
Hazardous Waste Quantity	0 (1) 2 3 4 5 6 7 8	1	1	8	
	Total Waste Characteristics Score		19	26	
[5] Targets					4.5
Surface Water Use	0 (1) 2 3	3	3	9	
Distance to a Sensitive Environment	0 (1) 2 3	2	2	6	
Population Served/Distance to Water Intake Downstream	(0) 4 6 8 10 12 16 18 20 24 30 32 35 40	1	0	40	
	Total Targets Score		5	55	
[6] If line [1] is 45, multiply [1] x [4] x [5] If line [1] is 0, multiply [2] x [3] x [4] x [5]			1710	64,350	
[7] Divide line [6] by 64,350 and multiply by 100		S_{sw} =	2.66		

FIGURE 7
SURFACE WATER ROUTE WORK SHEET

Rating Factor	Assigned Value (Circle One)	Multiplier	Score	Max. Score	Ref. (Section)
[1] Observed Release	0 45	1	0	45	5.1
Date and Location: June 1985 - Chevy Place between Girard Ave. and Niagara Falls Blvd., Niagara Falls, NY					
Sampling Protocol: OVA and HNu (see Ref. 3)					
If line [1] is 0, the S_a = 0. Enter on line [5]. If line [1] is 45, then proceed to line [2].					
[2] Waste Characteristics					5.2
Reactivity and Incompatibility	0 1 2 3	1		3	
Toxicity	0 1 2 3	3		9	
Hazardous Waste Quantity	0 1 2 3 4 5 6 7 8	1		8	
	Total Waste Characteristics Score			20	
[3] Targets					5.3
Population Within 4-Mile Radius	0 9 12 15 18 21 24 27 30	1		30	
Distance to Sensitive Environment	0 1 2 3	2		6	
Land Use	0 1 2 3	1		3	
	Total Targets Score			39	
[4] Multiply [1] x [2] x [3]			0	35,100	
[5] Divide line [4] by 35,100 and multiply by 100		S_a =	0		

FIGURE 9
AIR ROUTE WORK SHEET

	s	s^2
Groundwater Route Score (S_{gw})	8.95	80.10
Surface Water Route Score (S_{sw})	2.66	7.08
Air Route Score (S_a)	0	0
$S^2_{gw} + S^2_{sw} + S^2_a$		87.18
$\sqrt{S^2_{gw} + S^2_{sw} + S^2_a}$		9.34
$\sqrt{S^2_{gw} + S^2_{sw} + S^2_a} / 1.73 = S_M =$		5.40

FIGURE 10
WORKSHEET FOR COMPUTING S_M

Fire and Explosion Work Sheet					
Rating Factor	Assigned Value (Circle One)	Multi-plier	Score	Max. Score	Ref. (Section)
[1] Containment	1 3	1		3	7.1
[2] Waste Characteristics					7.2
Direct Evidence	0 3	1		3	
Ignitability	0 1 2 3	1		3	
Reactivity	0 1 2 3	1		3	
Incompatibility	0 1 2 3	1		3	
Hazardous Waste Quantity	0 1 2 3 4 5 6 7 8	1		8	
	Total Waste Characteristics Score			20	
[3] Targets					7.3
Distance to Nearest Population	0 1 2 3 4 5	1		5	
Distance to Nearest Building	0 1 2 3	1		3	
Distance to Sensitive Environment	0 1 2 3	1		3	
Land Use	0 1 2 3	1		3	
Population Within 2-Mile Radius	0 1 2 3 4 5	1		5	
Buildings Within 2-Mile Radius	0 1 2 3 4 5	1		5	
	Total Targets Score			24	
[4] Multiply [1] x [2] x [3]				1,440	
[5] Divide line [4] by 1,440 and multiply by 100		S_{FE} = not scored			

FIGURE 11
FIRE AND EXPLOSION WORK SHEET

Direct Contact Work Sheet					
Rating Factor	Assigned Value (Circle One)	Multi-plier	Score	Max. Score	Ref. (Section)
1 Observed Incident	(0) 45	1	0	45	8.1
If line 1 is 45, proceed to line 4 If line 1 is 0, proceed to line 2					
2 Accessibility	0 1 2 (3)	1	3	3	8.2
3 Containment	0 (15)	1	15	15	8.3
4 Waste Characteristics Toxicity	0 1 2 (3)	5	15	15	8.4
5 Targets					8.5
Population Within a 1-Mile Radius	0 1 2 (3) 4 5	4	12	20	
Distance to a Critical Habitat	0 1 (2) 3.	4	8	12	
Total Targets Score			20	32	
6 If line 1 is 45, multiply 1 x 4 x 5 If line 1 is 0, multiply 2 x 3 x 4 x 5			13,500	21,600	
7 Divide line 6 by 21,600 and multiply by 100		S_{DC} =	62.5		

FIGURE 12
DIRECT CONTACT WORK SHEET

5.4 HRS Documentation Records

DOCUMENTATION RECORDS
FOR
HAZARD RANKING SYSTEM

Instructions: As briefly as possible summarize the information you used to assign the score for each factor (e.g., "Waste quantity = 4,230 drums plus 800 cubic yards of sludges"). The source of information should be provided for each entry and should be a bibliographic-type reference. Include the location of the document.

Facility Name: 64th Street South

Location: Chevy Place between Girard Ave. and Niagara Falls Blvd., Niagara Falls, NY

Date Scored: June 22, 1987

Person Scoring: Jon Sundquist

Primary Source(s) of Information (e.g., EPA region, state, FIT, etc.):

Niagara County Health Department
NYSDEC Region 9 offices

Factors Not Scored Due to Insufficient Information:

Comments or Qualifications:

Fire and explosion factor not scored as the site has not been declared a fire hazard by a fire marshal.
Ref. No. 16

GROUNDWATER ROUTE

1. OBSERVED RELEASE

Contaminants detected (3 maximum):

None found onsite or downgradient from site
Ref. No. 1

Rationale for attributing the contaminants to the facility:

NA

* * *

2. ROUTE CHARACTERISTICS

Depth to Aquifer of Concern

Name/description of aquifer(s) of concern:

Lockport Dolomite
Ref. No. 2

Depth(s) from the ground surface to the highest seasonal level of the saturated zone [water table(s)] of the aquifer of concern:

0-20 ft
Ref. Nos. 2, 3

Depth from the ground surface to the lowest point of waste disposal/storage:

Unknown

Net Precipitation

Mean annual or seasonal precipitation (list months for seasonal):

30 in/yr
Ref. No. 2

Mean annual lake or seasonal evaporation (list months for seasonal):

27 in/yr
Ref. No. 4

Net precipitation (subtract the above figures):

3 in/yr

Permeability of Unsaturated Zone

Soil type in unsaturated zone:

Odessa-Lakemont-Ovid Association
Ref. No. 5

Permeability associated with soil type:

10^{-4} cm/sec
Ref. No. 5

Physical State

Physical state of substances at time of disposal (or at present time for generated gases):

Consolidated solids, although other types of wastes may have been dumped
Ref. No. 3

* * *

3. CONTAINMENT

Containment

Method(s) of waste or leachate containment evaluated:

None
Ref. No. 3

Method with highest score:

NA

4. WASTE CHARACTERISTICS

Toxicity and Persistence

Compound(s) evaluated:

Chrysene
Phenanthrene
Fluoranthene
Pyrene
Bis(2-Ethylhexyl)phthalate
Benzo(a)anthracene
Benzo(b)fluoranthene
Benzo(k)fluoranthene
Benzo(a)pyrene
Benzo(ghi)perylene
Dibenzo(a, h)anthracene
Alpha BHC
Beta BHC

Ref. No. 6

Compound with highest score:

Benzo(a)pyrene
Ref. No. 7

Hazardous Waste Quantity

Total quantity of hazardous substances at the facility, excluding those with a containment score of 0 (give a reasonable estimate even if quantity is above maximum):

0.04 tons

Basis of estimating and/or computing waste quantity:

Assuming 10 ppm total average contaminants in the soil, and assuming that all 10 acres were used for disposal, but only the top 0.25 ft are contaminated;

then total quantity =

$$(10 \text{ acre})\left(\frac{43{,}560 \text{ ft}^2}{\text{acre}}\right)(0.25 \text{ ft})\left(\frac{\text{yd}}{3 \text{ ft}}\right)\left(\frac{10 \text{ parts}}{1{,}000{,}000 \text{ parts}}\right)\left(\frac{1 \text{ ton}}{\text{yds}^3}\right) = 0.04 \text{ tons}$$

* * *

5. TARGETS

Groundwater Use

Use(s) of aquifer(s) of concern within a 3-mile radius of the facility:

Some use as drinking water within 3 miles, but alternate unthreatened sources available
Ref. No. 8

Distance to Nearest Well

Location of nearest well drawing from aquifer of concern or occupied building not served by a public water supply:

Near intersection of Witmer Road and Pennsylvania Ave.
Ref. No. 8

Distance to above well or building:

2.5 miles
Ref. No. 9

Population Served by Groundwater Wells Within a 3-Mile Radius

Identified water-supply well(s) drawing from aquifer(s) of concern within a 3-mile radius and populations served by each:

2 families

Computation of land area irrigated by supply well(s) drawing from aquifer(s) of concern within a 3-mile radius, and conversion to population (1.5 people per acre):

None
Ref. No. 9

Total population served by groundwater within a 3-mile radius:

8, assuming 4 persons per family

D1628

SURFACE WATER ROUTE

1. OBSERVED RELEASE

Contaminants detected in surface water at the facility or downhill from it (5 maximum):

None observed
Ref. No. 3

Rationale for attributing the contaminants to the facility:

NA

* * *

2. ROUTE CHARACTERISTICS

Facility Slope and Intervening Terrain

Average slope of facility in percent:

0%
Ref. No. 9

Name/description of nearest downslope surface water:

Niagara River, Tonawanda Channel
Ref. No. 9

Average slope of terrain between facility and above-cited surface water body in percent:

0.1%
Ref. No. 9

Is the facility located either totally or partially in surface water?

No
Ref. No. 9

Is the facility completely surrounded by areas of higher elevation?

No
Ref. No. 9

1-Year 24-Hour Rainfall in Inches

2.1 in
Ref. No. 4

Distance to Nearest Downslope Surface Water

0.75 mile
Ref. No. 9

Physical State of Waste

Consolidated solid
Ref. No. 3

* * *

3. CONTAINMENT

Containment

Method(s) of waste or leachate containment evaluated:

None
Ref. No. 3

Method with highest score:

NA

4. WASTE CHARACTERISTICS

Toxicity and Persistence

Compound(s) evaluated:

Chrysene
Phenanthrene
Fluoranthrene
Pyrene
Bis(2-ethylhexyl)phthalate
Benzo(a)anthracene
Benzo(b)fluoranthene
Benzo(k)fluoranthene
Benzo(a)pyrene
Benzo(ghi)perylene
Dibenzo(a,h)anthracene
Alpha BHC
Beta BHC

Ref. No. 6

Compound with highest score:

Benzo(a)pyrene
Ref. No. 7

Hazardous Waste Quantity

Total quantity of hazardous substances at the facility, excluding those with a containment score of 0 (give a reasonable estimate even if quantity is above maximum):

0.04 tons

Basis of estimating and/or computing waste quantity:

Assuming 10 ppm total average contaminants in the soil, and assuming that all 10 acres were used for disposal, but only the top 0.25 ft are contaminated;

then total quantity =

$$(10 \text{ acre})\left(\frac{43,560 \text{ ft}^2}{\text{acre}}\right)(0.25 \text{ ft})\left(\frac{\text{yd}}{3 \text{ ft}}\right)\left(\frac{10 \text{ parts}}{1,000,000 \text{ parts}}\right)\left(\frac{1 \text{ ton}}{\text{yds}^3}\right) = 0.04 \text{ tons}$$

* * *

5. TARGETS

Surface Water Use

Use(s) of surface water within 3 miles downstream of the hazardous substance:

Recreational
Ref. Nos. 8, 19, 14

Is there tidal influence?

No
Ref. No. 9

Distance to a Sensitive Environment

Distance to 5-acre (minimum) coastal wetland, if 2 miles or less:

NA
Ref. No. 9

Distance to 5-acre (minimum) fresh-water wetland, if 1 mile or less:

0.25 mile
Ref. 10

Distance to critical habitat of an endangered species or national wildlife refuge, if 1 mile or less:

NA
Ref. No. 11

Population Served by Surface Water

Location(s) of water-supply intake(s) within 3 miles (free-flowing bodies) or 1 mile (static water bodies) downstream of the hazardous substance and population served by each intake:

According to the Niagara County Health Department, contaminants may leave the site as runoff and enter the Chippawa (west) channel of the Niagara River at the 60th Street outfall, upstream of the City of Niagara Falls water intakes. The city intakes are near Navy Island, approximately 2.5 miles downstream from the 64th Street site.

Ref. No. 3

Computation of land area irrigated by above-cited intake(s) and conversion to population (1.5 people per acre):

NA
Ref. No. 8

Total population served:

0

Name/description of nearest of above water bodies:

Niagara River, Tonawanda Channel
Ref. No. 9

Distance to above-cited intakes, measured in stream miles:

NA

D1628

AIR ROUTE

1. OBSERVED RELEASE

Contaminants detected:

None reported
Ref. No. 3

Date and location of detection of contaminants:

NA

Methods used to detect the contaminants:

NA

Rationale for attributing the contaminants to the site:

NA

* * *

2. WASTE CHARACTERISTICS

Reactivity and Incompatibility

Most reactive compound:

No reactive compounds present
Ref. No. 6

Most incompatible pair of compounds:

NA

Toxicity

Most toxic compound:

NA
Ref. No. 6

Hazardous Waste Quantity

Total quantity of hazardous waste:

0.04 tons

Basis of estimating and/or computing waste quantity:

$$(10\ \text{acre})\left(\frac{43{,}560\ \text{ft}^2}{\text{acre}}\right)(0.25\ \text{ft})\left(\frac{\text{yd}}{3\ \text{ft}}\right)\left(\frac{10\ \text{parts}}{1{,}000{,}000\ \text{parts}}\right)\left(\frac{1\ \text{ton}}{\text{yds}^3}\right) = 0.04\ \text{tons}$$

* * *

3. TARGETS

Population Within 4-Mile Radius

Circle radius used, give population, and indicate how determined:

0 to 4 mi   (0 to 1 mi)   0 to 1/2 mi   0 to 1/4 mi

2,327
Ref. No. 13

Distance to a Sensitive Environment

Distance to 5-acre (minimum) coastal wetland, if 2 miles or less:

NA
Ref. No. 9

Distance to 5-acre (minimum) fresh-water wetland, if 1 mile or less:

0.5 miles
Ref. No. 10

Distance to critical habitat of an endangered species, if 1 mile or less:

NA
Ref. No. 11

Land Use

Distance to commercial/industrial area, if 1 mile or less:

0 mile
Ref. 9

Distance to national or state park, forest, or wildlife reserve, if 2 miles or less:

NA
Ref. No. 9

Distance to residential area, if 2 miles or less:

0 miles
Ref. No. 9

Distance to agricultural land in production within past 5 years, if 1 mile or less:

NA
Ref. No. 9

Distance to prime agricultural land in production within past 5 years, if 2 miles or less:

NA
Ref. No. 9

Is a historic or landmark site (National Register of Historic Places and National Natural Landmarks) within the view of the site?

No
Ref. No. 15

FIRE AND EXPLOSION

1. CONTAINMENT

Hazardous substances present:

No flammable material present
Ref. No. 12
Any organic chemicals present are thoroughly diluted in nonflammable soil
Ref. No. 6

Type of containment, if applicable

No flammable material present
Ref. No. 12

* * *

2. WASTE CHARACTERISTICS

Direct Evidence

Type of instrument and measurements:

NA
Ref. No. 12

Ignitability

Compound used:

NA Any organic chemicals present are thoroughly diluted in nonflammable soil
Ref. Nos. 6, 12

Reactivity

Most reactive compound:

NA
Ref. No. 12

Incompatibility

Most incompatible pair of compounds:

NA
Ref. No. 12

Hazardous Waste Quantity

Total quantity of hazardous substances at the facility:

0.04 tons

Basis of estimating and/or computing waste quantity:

$$(10 \text{ acre})\left(\frac{43,560 \text{ ft}^2}{\text{acre}}\right)(0.25 \text{ ft})\left(\frac{\text{yd}}{3 \text{ ft}}\right)\left(\frac{10 \text{ parts}}{1,000,000 \text{ parts}}\right)\left(\frac{1 \text{ ton}}{\text{yds}^3}\right) = 0.04 \text{ tons}$$

* * *

3. TARGETS

Distance to Nearest Population

0 miles
Ref. No. 9

Distance to Nearest Building

0 miles
Ref. No. 9

Distance to a Sensitive Environment

Distance to wetlands:

0.5 miles
Ref. No. 10

Distance to critical habitat:

N.A.
Ref. No. 11

Land Use

Distance to commercial/industrial area, if 1 mile or less:

0 miles
Ref. No. 9

Distance to national or state park, forest, or wildlife reserve, if 2 miles or less:

1.5 miles
Ref. No. 9
Buckhorn State Park

Distance to residential area, if 2 miles or less:

0 miles
Ref. No. 9

Distance to agricultural land in production within past 5 years, if 1 mile or less:

N.A.
Ref. No. 9

Distance to prime agricultural land in production within past 5 years, if 2 miles or less:

N.A.
Ref. No. 9

Is a historic or landmark site (National Register of Historic Places and National Natural Landmarks) within the view of the site?

No
Ref. No. 15

Population Within 2-Mile Radius

26,954
Ref. No. 13

Buildings Within 2-Mile Radius

10,209
Ref. No. 13

1. OBSERVED INCIDENT

Date, location, and pertinent details of incident:

None reported
Ref. No. 3

* * *

2. ACCESSIBILITY

Describe type of barrier(s):

No access limitations
Ref. No. 12

* * *

3. CONTAINMENT

Type of containment, if applicable:

None
Ref. No. 12

* * *

4. WASTE CHARACTERISTICS

<u>Toxicity</u>

Compounds evaluated:

Chrysene	Benzo(a)anthracene	Alpha BHC
Phenanthrene	Benzo(b)fluoranthene	Beta BHC
Fluoranthrene	Benzo(c)fluoranthane	
Pyrene	Benzo(a)pyrene	
Bis(2-Ethylhexyl)phthalate	Benzo(ghi)perylene	
	Dibenzo(a,h)anthracene	

Ref. No. 6

Compound with highest score:

Benzo(a)pyrene

* * *

5. TARGETS

<u>Population within one-mile radius</u>

2,327
Ref. No. 13

<u>Distance to critical habitat (of endangered species)</u>

NA
Ref. No. 11

D1628

R E F E R E N C E S

If the entire reference is not available for public review in the EPA regional files on this site, indicate where the reference may be found:

Reference Number	Description of the Reference
1	NUS Corporation, Final Report and Data Presentation for the LaSalle Area Groundwater Monitoring Program, Niagara Falls, New York, October 9, 1986, for the U.S. Environmental Protection Agency. Document location: Ecology and Environment, Inc., Buffalo, New York.
2	Johnston, R.H., Groundwater in the Niagara Falls Area, New York, State of New York Conservation Department, Water Resources Commission, Bulletin GW-53. Document location: Ecology and Environment, Inc., Buffalo, New York.
3	Nicky, Paul, Niagara County Health Department, Draft Profile Report, 64th Street South Waste Disposal Site. Document location: Niagara County Health Department, Niagara Falls, New York.
4	40 CFR, Part 300, Appendix A. Document location: Ecology and Environment, Inc., Buffalo, New York.
5	Higgins, B.A., P.S. Puglia, R.P. Leonard, T.O. Yoakum, W.A. Wirtz, Soil Survey of Niagara County, New York, USDA Soil Conservation Service, 1972. Document location: Ecology and Environment, Inc., Buffalo, New York.
6	Myers, Neil, NUS Corporation, September 5, 1985 letter to Diana Messina, U.S. Environmental Protection Agency, Region II. Document location: NYS Department of Environmental Conservation, Region 9, Buffalo, New York.
7	Sax, N. Irving, Dangerous Properties of Industrial Materials, sixth edition, Von Nostrand Rheinhold Company, New York. Document location: Ecology and Environment, Inc., Buffalo, New York.
8	Brown, Dean, Town of Niagara Water Department, personal communication to Jon Sundquist. Document location: Ecology and Environment, Inc., Buffalo, New York.
9	USGS, Niagara Falls and Tonawanda West 7.5 Minute Quadrangles, 1980. Document location: Ecology and Environment, Inc., Buffalo, New York.
10	New York State Department of Environmental Conservation, Region 9, Wetlands maps for Niagara County. Document location: NYSDEC, Region 9, Buffalo, New York.
11	Snider, James, Wildlife Biologist, New York State Department of Environmental Conservation, Region 9, personal communication, June 2, 1987. Document location: Ecology and Environment, Inc., Buffalo, New York.
12	Ecology and Environment Site Inspection, 64th Street South, June 12, 1987. Document location: Ecology and Environment, Inc., Buffalo, New York.
13	Graphical Exposure Modeling System, June 1987, Office of Pesticides and Toxic Substances, Federal Plaza, New York, New York. Document location: Ecology and Environment, Inc., Buffalo, New York.

Reference Number	Description of the Reference
14	Burmaster, Jon, personal communication, Niagara County Water Department. Document location: E & E, Buffalo, New York.
15	Murtagh, W.J., 1976, The National Register of Historic Places, USDA National Parks Service, Washington, D.C., with updates from the Federal Register. Document location: E & E, Buffalo, New York.
16	Hopkins, Michael, 1987, personal communication, Niagara County Health Department, Niagara Falls, New York. Document location: E & E, Buffalo, New York.

D1628

REFERENCE NO. 1

R-584-08-86-04

FINAL REPORT AND DATA PRESENTATION FOR THE LASALLE AREA GROUNDWATER MONITORING PROGRAM NIAGARA FALLS, NEW YORK

TECHNICAL DIRECTIVE DOCUMENT NO. 02-8508-19
CONTRACT NO. 68-01-6699

FOR THE

ENVIRONMENTAL SERVICES DIVISION
U.S. ENVIRONMENTAL PROTECTION AGENCY

OCTOBER 9, 1986

NUS CORPORATION
SUPERFUND DIVISION

SUBMITTED BY

PETER L. von SCHONDORF
PROJECT MANAGER

REVIEWED/APPROVED BY

RONALD M. NAMAN
REGIONAL PROJECT MANAGER

1.0 EXECUTIVE SUMMARY

This report includes the following items:

- o A characterization of the hydrogeology underlying the LaSalle Residential Area.
- o A presentation of the results for the soil samples collected during installation of the United States Environmental Protection Agency (EPA) wells in the LaSalle Residential Area.
- o A presentation of the results of the May sampling of the groundwater monitoring wells located in the LaSalle Residential Area.
- o A comparison of the results of the four groundwater sampling events conducted in the LaSalle Residential Area between January 27, 1986 and May 16, 1986.

From October 30, 1985 to May 8, 1986, EPA's contractor installed six clusters of monitoring wells in the LaSalle Residential Area. Each cluster included at least four wells installed to monitor different groundwater intervals. A total of 25 wells were installed. Figure 1-1 illustrates the general well design and relative positions of the monitoring intervals. Table 1-1 gives a general description of each well. The monitoring intervals include:

- o The shallow groundwater present in the overburden.
- o The regolith (a zone of highly weathered and fractured rock at the interface between the bedrock and overburden)
- o A shallow bedrock fracture zone
- o The second fracture zone encountered in the bedrock.

Based on the water level data provided in Table 1-1 from the EPA wells and two USGS (U.S. Geologic Survey) wells in the LaSalle Area, a characterization of the

recycled paper
ecology and environment

groundwater flow patterns in each groundwater interval was developed. Figure 1-2 indicates the direction of groundwater flow in each interval.

Borehole logging conducted during installation of the EPA wells provided additional information about the thickness and extent of the overburden and bedrock layers. An analysis of this information identified a layer of dense clay between the shallow groundwater and the regolith. This clay layer appears to act as a barrier preventing upward movement of contaminants into the shallow groundwater.

Both soil and groundwater sampling was conducted during this study. Samples were analyzed for the standard Hazardous Substance List (HSL) parameters plus several other parameters of interest under special analytical services (SAS) including ammonia nitrogen (NH_3), total organic carbon (TOC), total inorganic carbon (TIC), total organic halogens (TOX), specific gravity, hexavalent chromium (Cr^{+6}), total recoverable phenolics, and cyanide (CN^{-1}). The HSL compounds are listed in two categories, organic and inorganic compounds. Organic compounds are carbon based and inorganic compounds are compounds that are not carbon based. The organic compounds are classified further into the following categories: volatiles, semivolatiles, pesticides and polychlorinated biphenyls (PCB's). They are grouped because of their behavioral characteristics or chemical make-up. For instance, volatile organic compounds are those compounds that will transfer from water into air most rapidly. In addition, some other analyses of interest were performed. These additional analyses are termed SAS parameters in the tables listing sample results.

All analyses are reported in terms of concentration. Data for water analyses are given in ug/l (micrograms per liter) which is equivalent to parts per billion (ppb) or mg/l (milligrams per liter) which is equivalent to parts per million (ppm). Soil sample data is given in ug/kg (micrograms per kilogram), equivalent to parts per billion (ppb) or mg/kg (milligrams per kilogram), equivalent to parts per million (ppm).

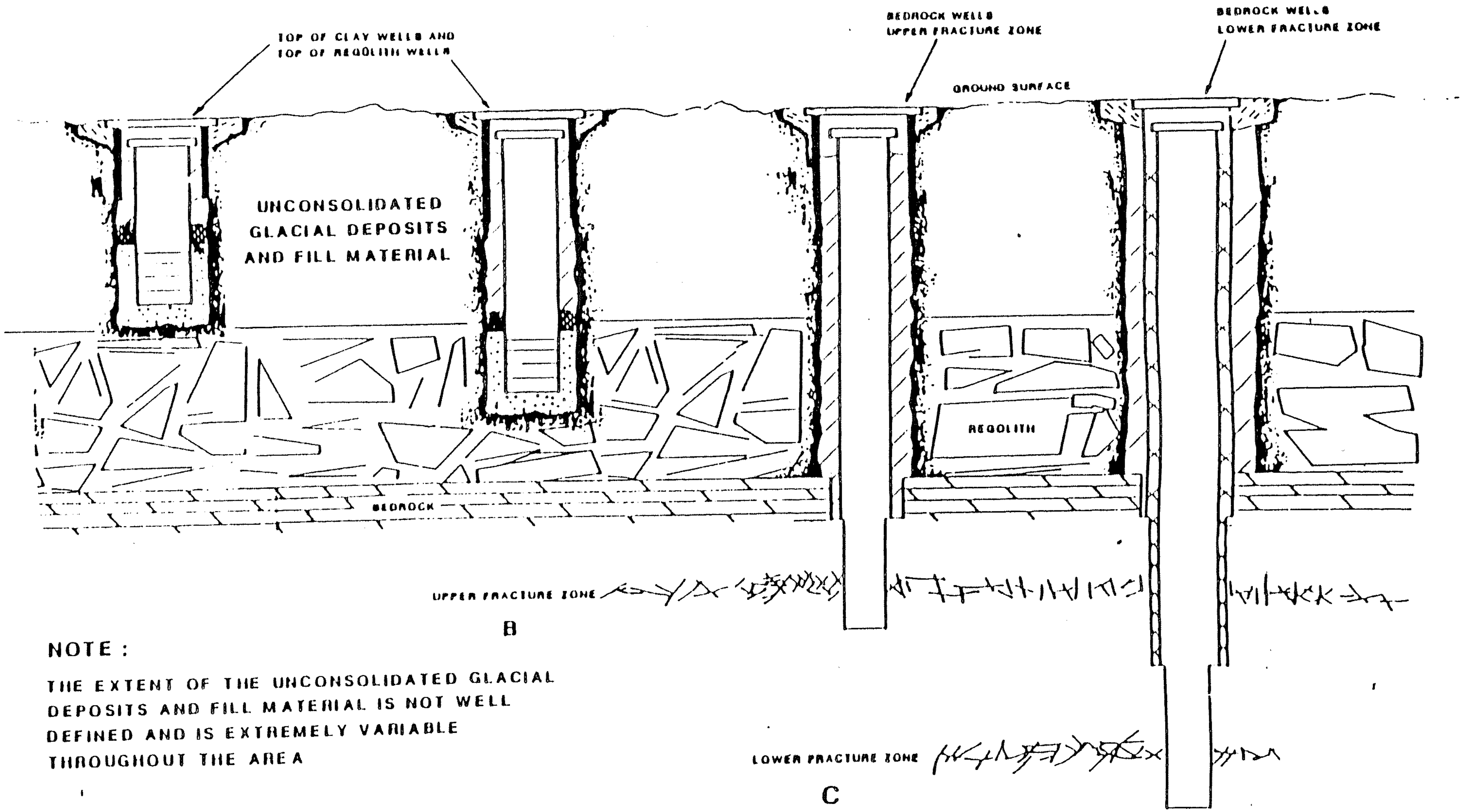
The sample results are provided in Tables A-1 and A-2 of Appendix A. If a compound was not detected by laboratory equipment, the space is blank. A "J" indicates the compound was detected, but the concentration was too low for an accurate measurement. A "J" is referred to as a "trace amount" in the text. A "B" following a "J" or a number means the compound was also found in the laboratory blank, indicating that field procedures or laboratory analysis could have resulted in contamination of the sample. An "E" indicates the sample did not pass EPA's quality assurance/quality control (QA/QC) standards.

During installation of the EPA monitoring wells a soil sample was collected from each borehole. A total of 24 soil samples were collected. The only organic contaminant detected in these samples was toluene. Concentrations of toluene ranged from trace amounts to 210 ug/l. Toluene was not present in most of the groundwater samples and is, therefore, not considered to be related to any groundwater contamination.

Between May 12 and 14, 1986, twenty-seven groundwater samples were collected from the EPA wells and two USGS wells in the LaSalle Residential Area. Figure 1-3 provides the location of all wells sampled in the LaSalle area. The only measurable organic contamination was confined to three wells: MW2B and MW2C at Cluster 2 and USGS well NFB-9. All organic contaminants identified were volatile organics. In MW2B the following volatile organics were found: vinyl chloride, 1,1-dichloroethene, trans-1,2-dichloroethene, trichloroethene and benzene. The volatile organic compounds detected in MW2C were vinyl chloride, trans-1,2,-dichloroethene, carbon disulfide and benzene. In USGS well NFB-9, vinyl chloride and trans-1,2-dichloroethene were found.

Inorganic and other SAS results did not indicate any levels of concern.

The EPA wells in the LaSalle Residential Area have been sampled on four separate occasions. During each of these sampling events the measurable organic contamination occurred primarily at Cluster 2 and at USGS well NFB-9. Figure 1-4 provides a graphical comparison of the levels of organic compounds detected during each sampling event. In each case none of the contaminants found in wells MW2B and MW2C were present in well MW2A. The lack of contamination in well MW2A indicates the lacustrine clay layer is probably an effective barrier to upward migration of contaminants in the LaSalle Residential Area. Figure 6-2 indicates the variation in concentration of semi-volatiles, pesticides, and cyanide by sampling event. This figure illustrates, as does figure 1-4, that contamination occurs at highest concentrations in monitoring well MW2B. Figure 1-5 also indicates contaminants have been detected at low levels in wells MW1B, MW2C, MW3AA, and MW6A, but not in a consistent manner.



NOTE:

THE EXTENT OF THE UNCONSOLIDATED GLACIAL DEPOSITS AND FILL MATERIAL IS NOT WELL DEFINED AND IS EXTREMELY VARIABLE THROUGHOUT THE AREA

FIGURE 1-1

SUBSURFACE ZONES FOR MONITORING WELLS

LASALLE AREA GROUNDWATER MONITORING PROGRAM

NIAGARA FALLS, N.Y.

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TABLE 1-1

WATER LEVELS AND WELL DESCRIPTIONS

WELL NUMBER	WATER BEARING ZONE	SCREENED DEPTH OR OPEN HOLE (Feet)	GROUNDWATER ELEVATION *
MW1A	Overburden	8 - 13	569.67
MW1B	Regolith	17.5 - 22.5	570.03
MW1C	Upper Bedrock Fracture Zone	30 - 33	562.81
MW1D	Lower Bedrock Fracture Zone	61.0 - 71.0	564.90
MW2A	Overburden	11 - 16	565.06
MW2B	Regolith	21 - 26	560.90
MW2C	Upper Bedrock Fracture Zone	30 - 33	563.94
MW2D	Lower Bedrock Fracture Zone	68.0 - 75.0	562.48
MW3AA	Overburden	2 - 7	566.13
MW3A	Overburden	11.5 - 16.5	561.71
MW3B	Regolith	19.5 - 24.5	557.57
MW3C	Upper Bedrock Fracture Zone	30.5 - 37	560.64
MW3D	Lower Bedrock Fracture Zone	48 - 55	559.23
MW4A	Overburden	5.5 - 10.5	567.04
MW4B	Regolith	21 - 26	551.80
MW4C	Upper Bedrock Fracture Zone	30 - 35	550.90
MW4D	Lower Bedrock Fracture Zone	71.5 - 82.0	556.90
MW5A	Overburden	5 - 10	568.25
MW5B	Regolith	25.0 - 34.5	562.25
MW5C	Upper Bedrock Fracture Zone	35 - 48	562.70
MW5D	Lower Bedrock Fracture Zone	72 - 92	562.65
MW6A	Overburden	4.5 - 9.5	569.04
MW6B	Regolith	22.5 - 27.5	561.32
MW6C	Upper Bedrock Fracture Zone	33 - 44	561.41
MW6D	Lower Bedrock Fracture Zone	44 - 61	562.48
NFB-9	Regolith	22 - 24	559.11
NFB-10	Regolith	23 - 25	560.29

* Groundwater elevations measured in feet above the USGS Mean Sea Level Datum, all elevations measured the week of 5/12/86.

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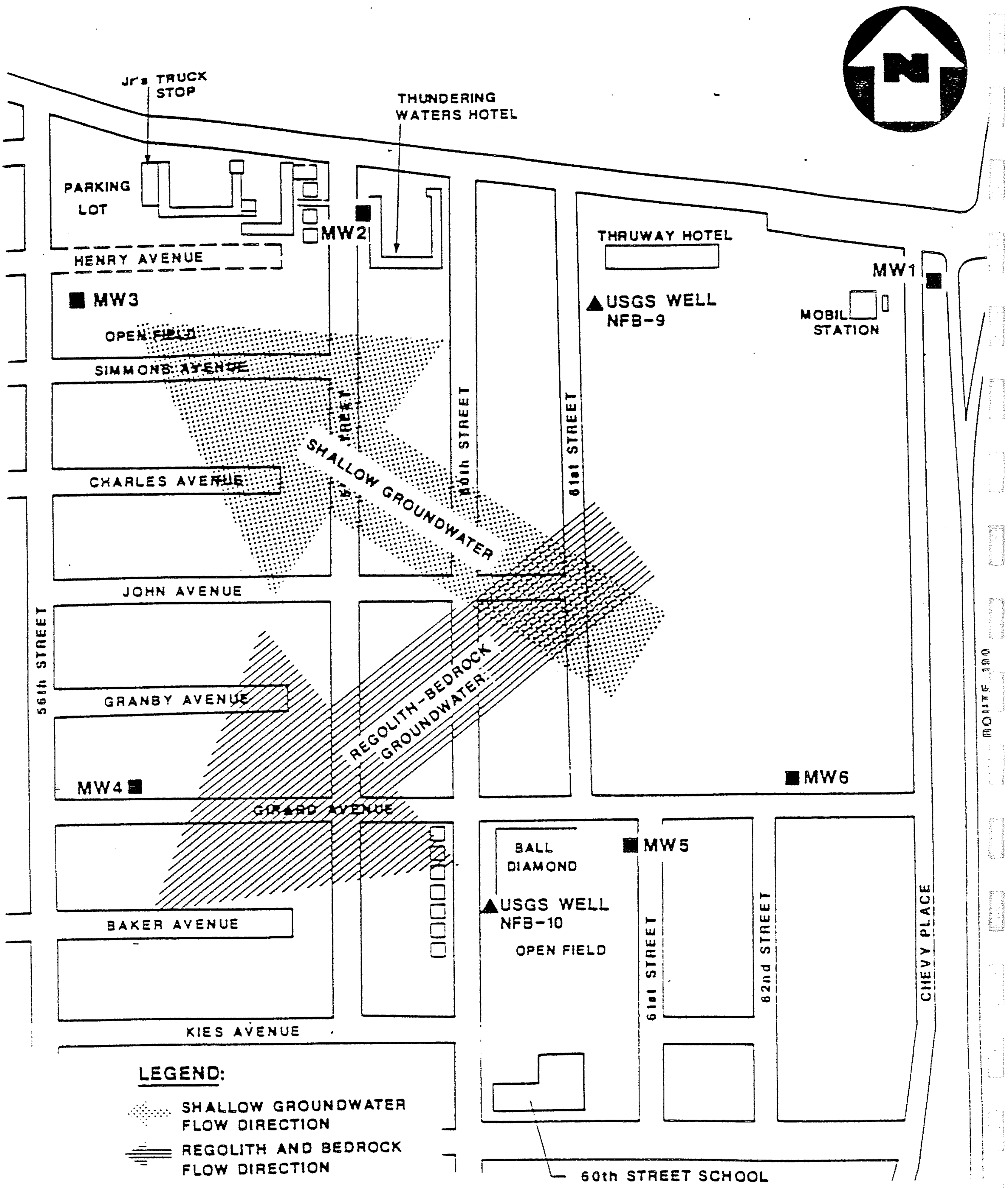

GENERALIZED GROUNDWATER FLOW DIRECTION MAP

LASALLE AREA

GROUNDWATER MONITORING PROGRAM

NIAGARA FALLS, N.Y.

FIGURE 1-2

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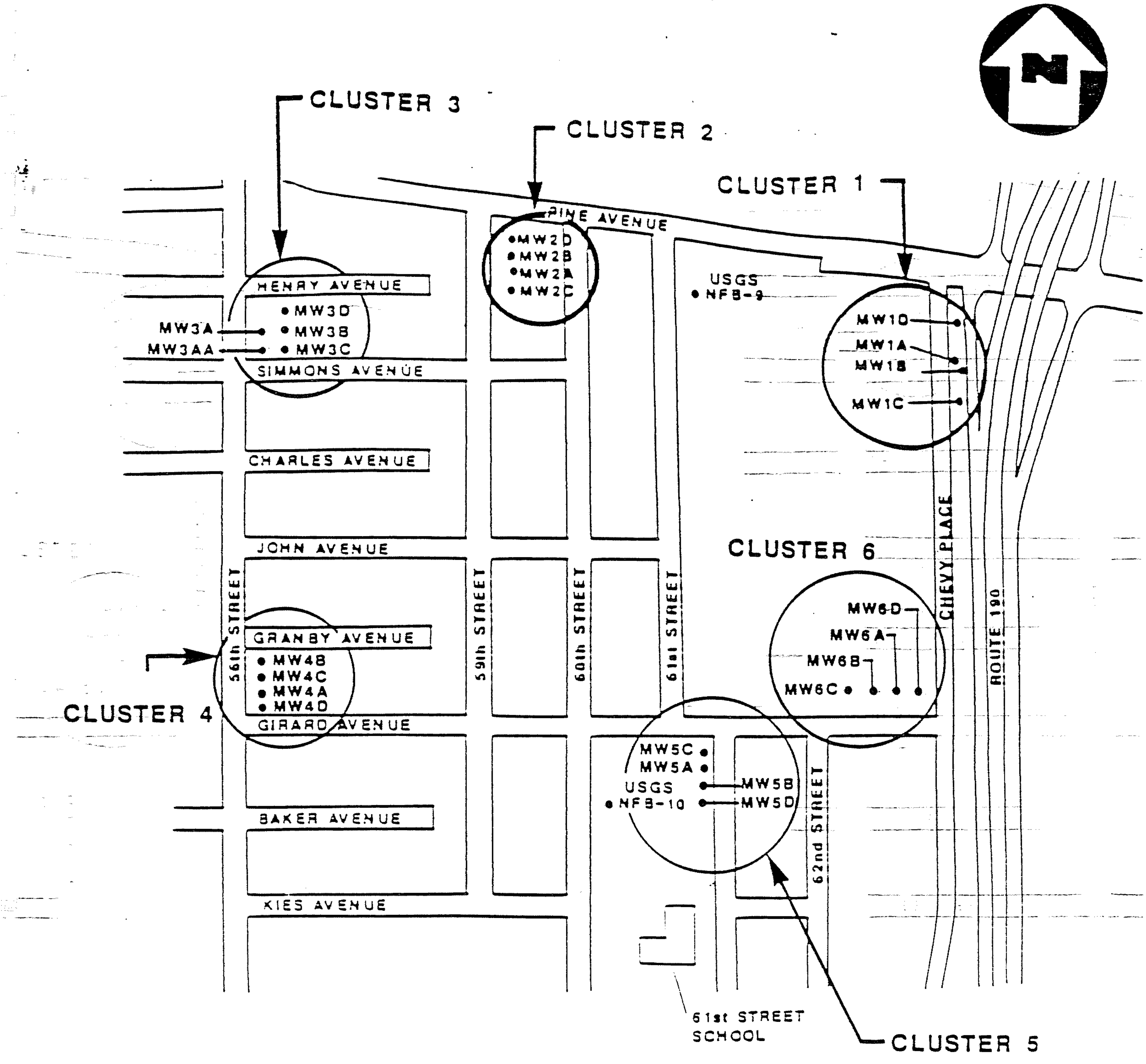

LEGEND

● SAMPLED EPA AND USGS WELLS

FIGURE 1-3

MONITORING WELL LOCATION MAP

LASALLE AREA GROUNDWATER MONITORING PROGRAM

NIAGARA FALLS, N.Y.

(NOT TO SCALE)

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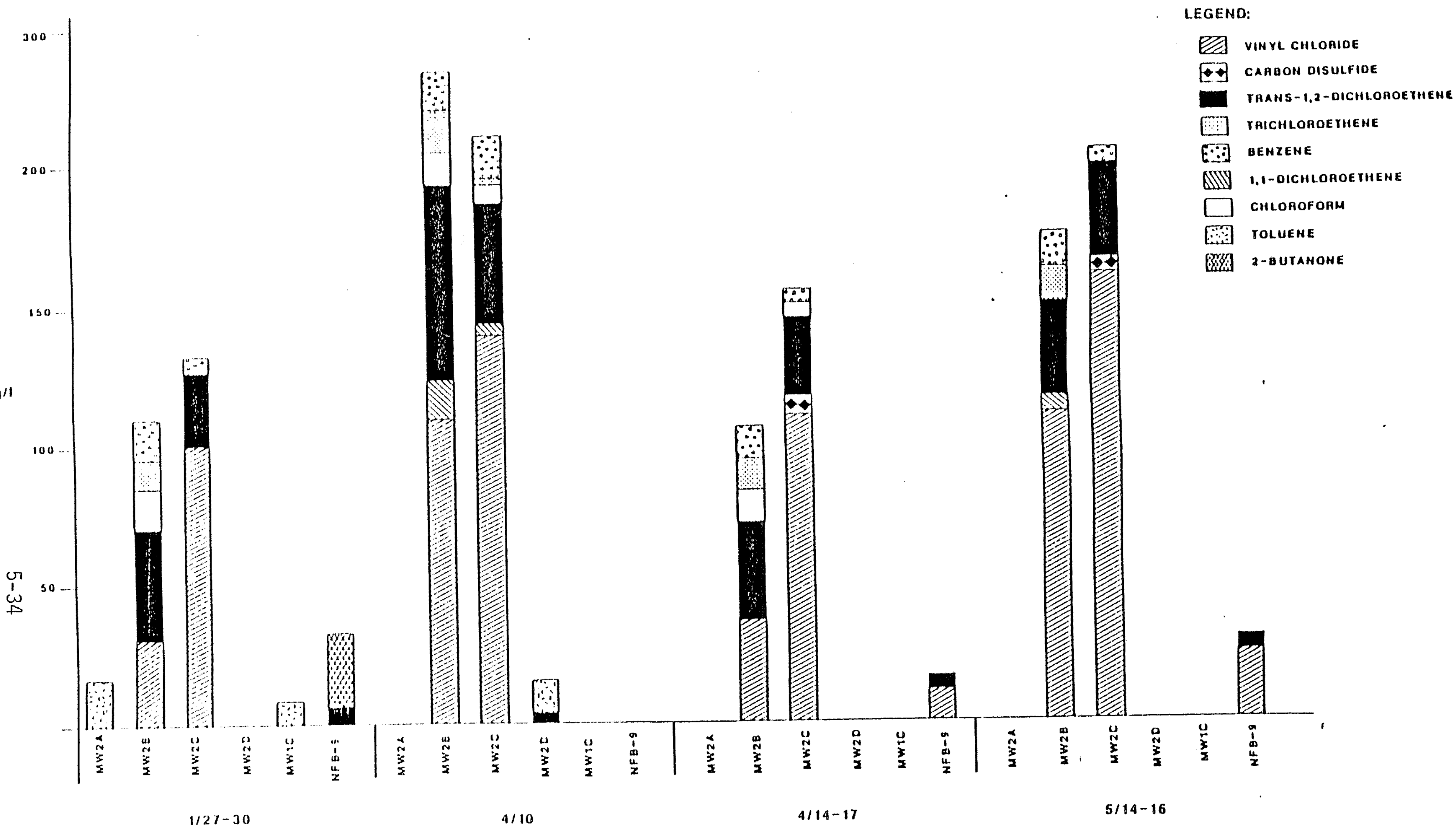

FIGURE 1-4

VARIATIONS OF VOLATILE ORGANIC CONCENTRATIONS PER SAMPLING EVENT

LaSALLE AREA GROUNDWATER MONITORING PROGRAM

NIAGARA FALLS, N.Y.

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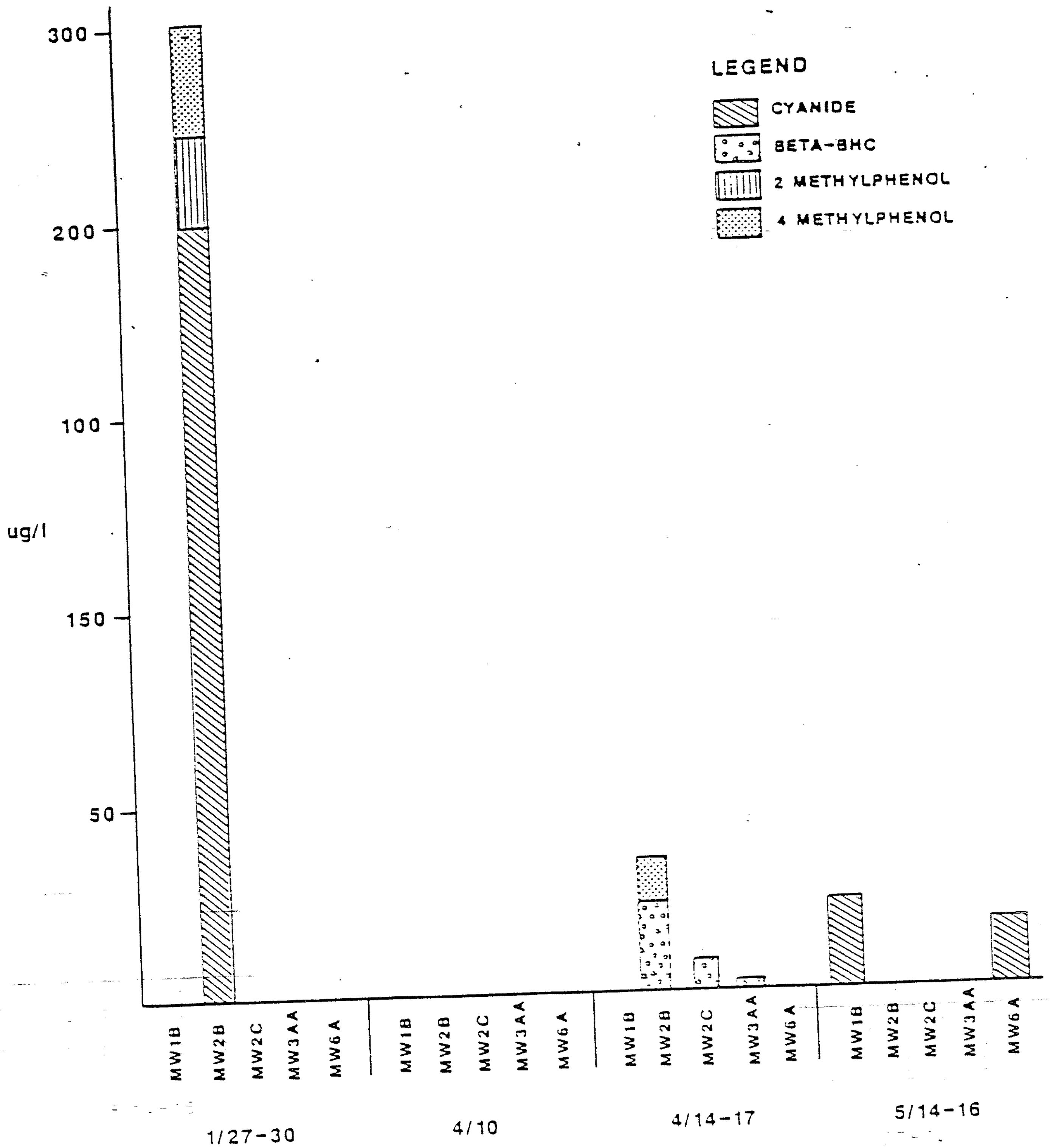

VARIATIONS OF SEMI-VOLATILES, PESTICIDES AND CYANIDE PER SAMPLING EVENT

LaSALLE AREA GROUNDWATER MONITORING PROGRAM

NIAGARA FALLS, N.Y.

FIGURE 1-5

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2.0 OBJECTIVE

The objective of this study was to define the hydrogeologic framework and characterize soil and groundwater quality in the LaSalle residential area. Groundwater samples were collected during four sampling events from twenty-five monitoring wells installed by EPA during the period of October 30, 1985 to May 8, 1986 and from two existing USGS wells. In addition, twenty-four soil samples were collected during the installation of the EPA wells. All samples were analyzed to determine the presence or absence of HSL compounds.

3.0 INTRODUCTION

NUS Corporation, acting as the Field Investigation Team (FIT), was requested by the U.S. Environmental Protection Agency (EPA) Region II to conduct an investigation of groundwater contamination in the LaSalle residential area of Niagara Falls, New York under Technical Directive Document (TDD) No. 02-8508-19. The study was divided into two areas; one area consists of three well clusters immediately south of Niagara Falls Boulevard and the remaining area consists of three well clusters in the vicinity of Girard Avenue. This report presents the results of the soil sampling conducted between October 30, 1985 and April 24, 1986. It also presents the results of groundwater sampling conducted between May 12 and May 14, 1986 on all wells constructed for this study and two existing USGS wells. A comparison with previous sampling results is also provided. A well cluster location map is provided in Figure 1-1.

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4.0 GEOLOGY AND HYDROGEOLOGY

The first section of this chapter describes the geologic units observed during the well installation in the LaSalle area. The second section describes the hydrogeologic setting and how it may influence contaminant migration.

4.1 Study Area Geology

The geology of the Niagara Falls area has been well documented, particularly by the U.S. Geologic Survey[1], the New York State Water Resources Commission[2] and the Buffalo Society of Natural Sciences[3]. The information gained from the installation of 25 monitoring wells provided a more detailed understanding of the study area.

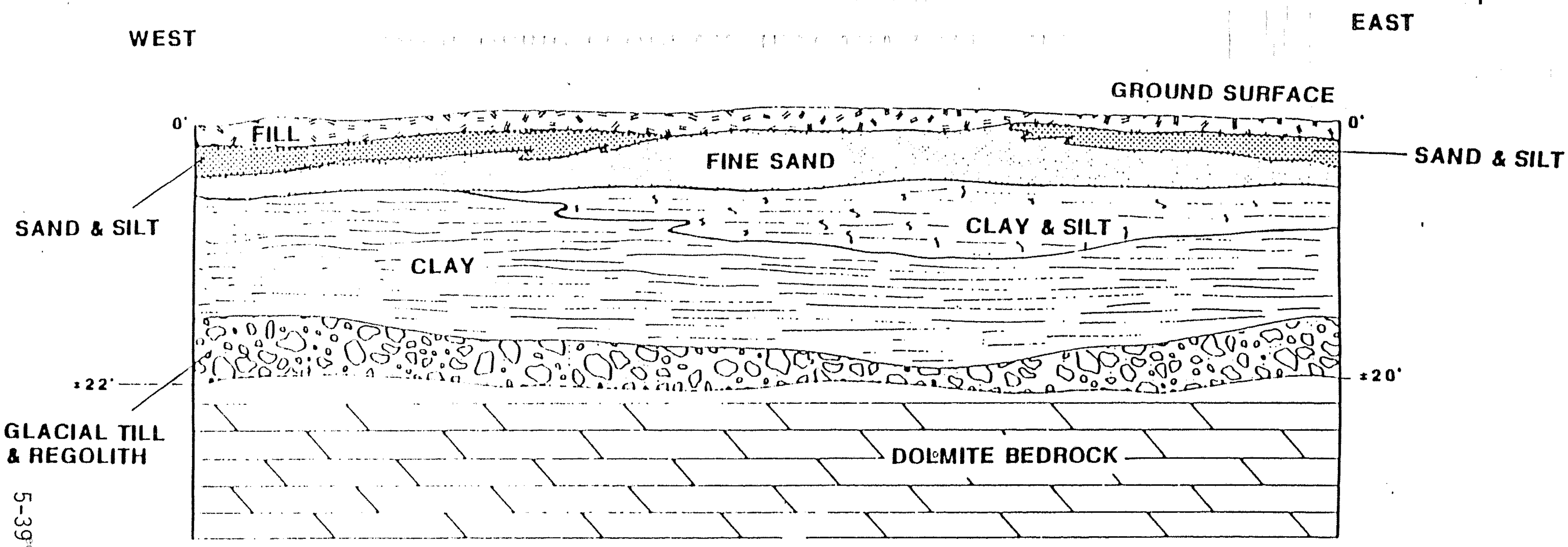
Interpretations were made from continuous sampling of the overburden and continuous rock cores of the bedrock. One borehole at each monitoring well cluster was continuously split spoon sampled through the overburden to the bedrock surface or a surface of refusal. Two borings of each well cluster were intended to be bedrock monitoring wells and these were continuously rock cored to their respective target depths.

A generalized cross-section of the area may be found in figure 4-1.

4.1.2 Unconsolidated Deposits

The unconsolidated overburden of the study area is dominated by Pleistocene glacial deposits. During the Pleistocene era four glacial stages advanced through Niagara Falls. The latest stage, the Wisconsin, is responsible for many of the observed topographic features and deposits.

The basal unit of the overburden is regolith, a layer of fractured Lockport Dolomite blocks surrounded by a matrix of sand and silt. The layer is of variable thickness across the study area and is frequently undiscernible from the overlying glacial till. Regolith is formed by the erosion of the bedrock surface and the separation of individual blocks from the rock surface. Material from the erosion process and/or overlying soils may form a matrix around the blocks. Regolith



GENERALIZED CROSS-SECTION OF SOIL AND BEDROCK STRATIGRAPHY

LASALLE AREA GROUNDWATER

MONITORING PROGRAM, NIAGARA FALLS, N.Y.

FIGURE 4-1

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blocks several feet thick were observed during this study. Glaciation may have removed the regolith zone from some locations, as the regolith is not always observed.

The regolith is overlain by glacial till throughout the study area. The till was formed by the advancing glaciers eroding the bedrock surface as the ice moved forward. As interpreted from borehole samples, the till is a dense unit of unstratified cobbles, gravels, sand, silt and clay. It is red brown in color grading to gray at the regolith contact. Samples were frequently moist, with increasing moisture at the contact with the regolith or bedrock. The unit appears variable in thickness, although limitations in defining the regolith-till contact made the thickness difficult to determine.

Lacustrine (of lake origin) deposits were found consistently throughout the study area overlying the glacial till. Ranging in thickness from seven to fifteen feet, the unit appears wedge shaped, with increased thickness southward reflecting the bedrock surface. The lacustrine sediments are typical of other lacustrine deposits in the Niagara Falls area. The basal unit consists of loose, occasionally plastic varved (thinly layered) clay. Silt and/or sand lenses periodically interupt the varved sequence, but are not observed to be continuous across the study area. Above the varved sequence a body of silt or silty clay is observed. In comparison to the clay layer below, density increases, varves are rare, plasticity decreases and mottling is observed. The mottling is blue-grey and is probably due to fluctuating water levels. This phenomenon may have occurred during recent times, or it may have been part of an over-all desiccation process of the former lake bottom.

The lacustrine clay sequence is overlain by a bed of silty fine sand. The unit appears to be quite extensive and perhaps fluvial (stream deposited) in origin. However, limited information makes any interpretation tentative. The occurrance of interbedded silts suggests cyclic patterns of sediment transport. This analysis is consistent with glacio-fluvial (originating from glaciers and streams) systems. Urbanization has apparently altered the upper surface of the sand bed and has replaced it with miscellaneous fill.

A layer of fill was observed at every well cluster location in the study area. The fill consisted mostly of soil, but at times contained construction or demolition debris. It is not known if the fill forms a continuous layer over the study area or exists in localized patches.

4.1.3 Bedrock

The erosion surface of the bedrock was encountered between 27 feet deep (MW4D) and 21 feet deep (MW3D and MW1C). It slopes gently to the south between the northern and southern sites, dropping in elevation from three to four feet over a distance of 1300 to 1400 feet. The surface is assumed to be planar, although glacial erosion may have left an irregular surface on which the glacial materials were deposited. See figure 4-2 for a computer-generated top of bedrock contour map.

Stratigraphic correlations of the bedrock between the cluster sites are difficult to make due to the homogeneity of the rock seen in core samples. There are no distinct beds or fossil zones to use as stratigraphic markers. The rock is a light to dark gray dolostone with some massive greyish-brown beds. The bedding is thinly laminated to thinly bedded where it is not massive. Weathering of the bedrock surface by exposure to the atmosphere prior to the deposition of the overburden and weathering at depth through solution by moving groundwater varies between the sites and within individual cores, although the rock is more weathered near its surface. Vugs (voids in the rock due to solution by groundwater) are common, and some of them are filled with gypsum, a very soft calcium sulfate mineral. Gypsum is also found along bedding plane fractures where it precipitated from moving groundwater, becoming up to one-eighth inch thick. There also large deposits of gypsum, up to six inches thick, but these are much less common.

In a few cores, calcite crystals were seen on fracture surfaces and in vugs, giving the rock a sparkly appearance. The calcite is in the deeper part of the cores and is present when gypsum is absent, indicating that at some time a change in the groundwater chemistry favored the precipitation of calcite over gypsum at greater depths.

The most common and distinctive feature within the lockport is its fracture system. Two orientations have been observed, a flat lying bedding plane fracture

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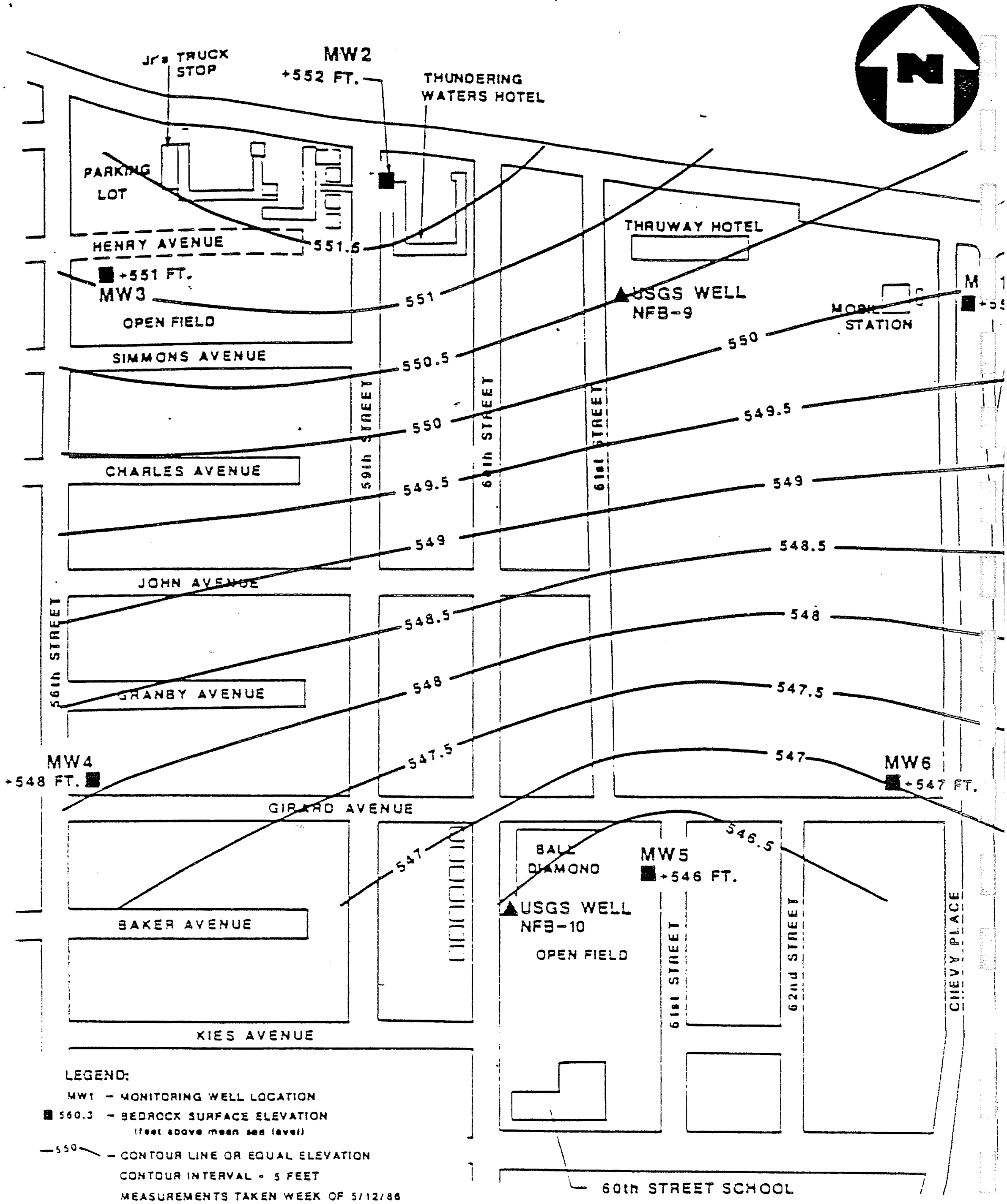

TOP OF BEDROCK CONTOUR MAP

LASALLE AREA

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FIGURE 4-2

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5-42

and a near vertical high angle fracture. The horizontal bedding plane fractures are common throughout the Lockport and especially frequent in thinly bedded units. Vertical fracturing is reportedly common especially in outcrops, but was observed infrequently in cores. Vertical fracturing observed in cores were most common in the upper ten to fifteen feet of core and may be the result of rock expansion after glacial ice removal. Deeper vertical fracturing may also have their origins linked to ice removal or possibly an older deformation history related to Appalachian mountain building.

Fracture patterns have been observed by many and grouped into zones. Johnston claims at least seven unique fracture zones which are important to the overall hydrogeology of the Niagara Falls area[3]. Correlating fracture patterns in the LaSalle area was attempted, but no clear fracture patterns were observed.

4.2 Hydrogeology

The hydrogeology of the study area is a complex system involving an overburden of glacio-fluvial sediments and bedrock of Lockport Dolomite and Rochester Shale. A cover of man-made soil fill materials is common in the area. For the purposes of this investigation only the unconsolidated overburden and the two upper most fracture zones within the Lockport Dolomite were investigated. Figure 4-3 provides an idealized diagram of the area's geology and the different types of wells that were installed to monitor the groundwater.

The monitoring well locations were designed to provide geologic and hydrologic information on both the overburden and upper rock units in the vicinity of the LaSalle residential area. Figure 4-4 provides a well cluster location map. A computer generated contour map of groundwater levels was generated for each monitored zone. The resulting contour maps are based on data collected during May, 1986 sampling and can be found in Figures 4-7 through 4-10. The groundwater flow direction on these maps is perpendicular to the contour lines and moves from lines of higher elevation to lines of lower elevation.

4.2.1 Unconsolidated Overburden Aquifers

Wells were installed within the overburden of the study area to examine

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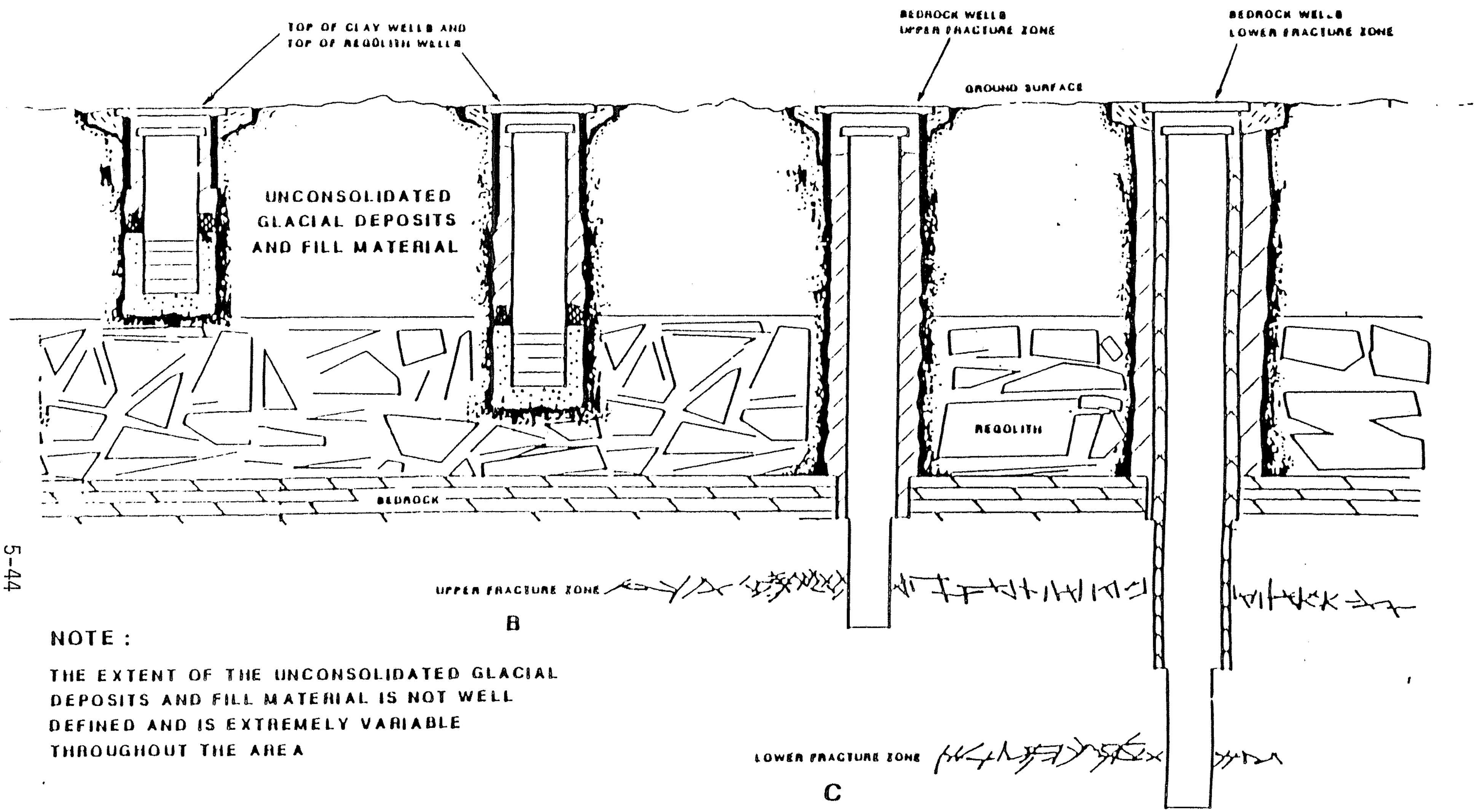

NOTE :

THE EXTENT OF THE UNCONSOLIDATED GLACIAL DEPOSITS AND FILL MATERIAL IS NOT WELL DEFINED AND IS EXTREMELY VARIABLE THROUGHOUT THE AREA

FIGURE 4-3

SUBSURFACE ZONES FOR MONITORING WELLS

LASALLE AREA GROUNDWATER MONITORING PROGRAM

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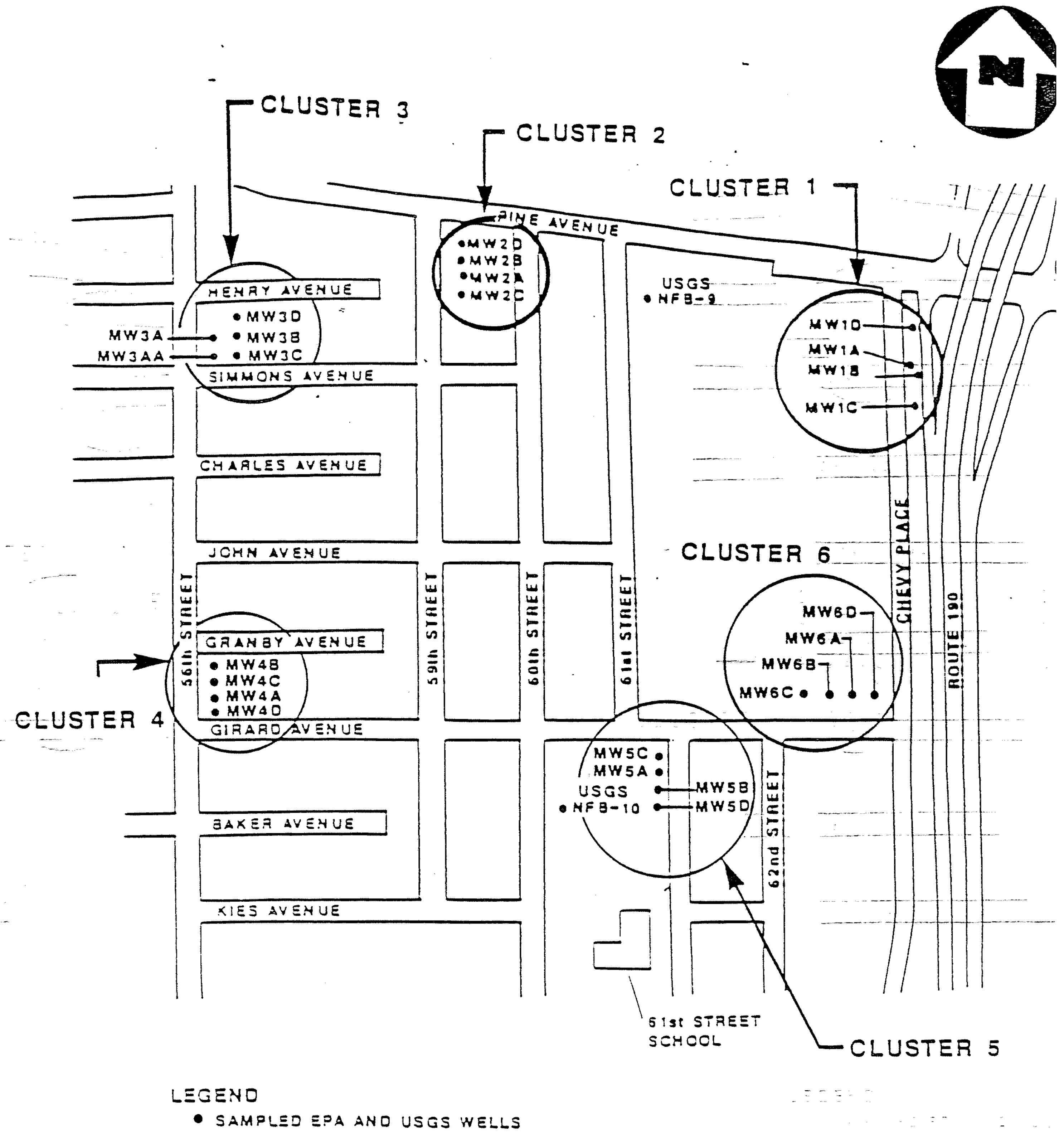

FIGURE 4-4

MONITORING WELL LOCATION MAP

LASALLE AREA GROUNDWATER MONITORING PROGRAM

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groundwater quality and flow. See figures 4-5 and 4-6 for graphic illustration of the strata and well placement. Two strata were picked for investigation, the fine grained fluvial sand overlying the lacustrine clay, and the regolith zone. Wells within the alluvium and lacustrine clay were installed to monitor shallow groundwater conditions. It is proposed that the lacustrine clay might act as a confining unit for groundwater in the area. Regolith wells were installed to monitor groundwater flow at the overburden-bedrock interface. The top of the Lockport, being a regionally continuous surface, offers a location to monitor water that has potentially been transported long distances.

4.2.2 Shallow Groundwater

Seven wells were installed to monitor the shallow groundwater water conditions found above the lacustrine clay sequence. Elevations of the groundwater observed in these wells range from +565.06 (MW2A) to +569.67 (MW1A). A complete listing of water level measurements may be found in Table 4-1. Water level elevations at MW3A and MW3AA were not mentioned in the above range because two perched water lenses were found at this location. A computer generated groundwater potentiometric contour map (figure 4-7) indicates flow to be moving northwesterly. The model for A-type wells is an idealized construction of this complex hydrologic system. The natural variation within the clay layer caused by a change in sediments and man-made disruptions caused by the John Avenue sewer may impact on the groundwater flow patterns. The municipal infrastructure may act to disrupt the clay, channelizing and/or cutting off water flow within perched zones. It is believed however, that the clay layer is of sufficient thickness that most infrastructures would not break the integrity of the clay.

4.2.3 Regolith Aquifer

Six wells were installed into the regolith zone to monitor water conditions at the overburden-bedrock interface (see figures 4-5 and 4-6). Two USGS wells, NFB-9 and NFB-10, were also sampled and measured for water levels, being considered regolith monitoring wells. Observed groundwater elevations range from +551.8

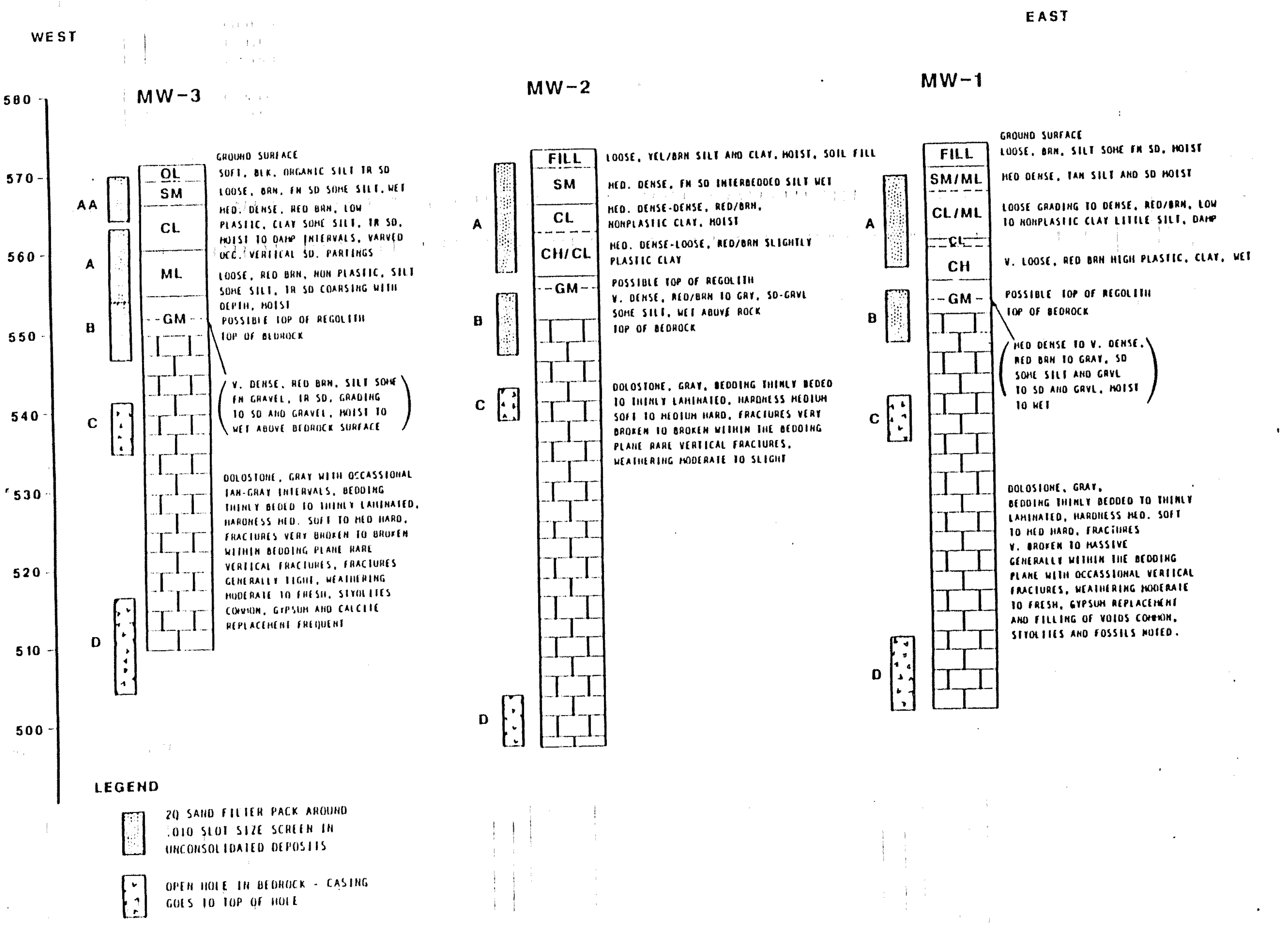

FIGURE 4-5

SUBSURFACE WEST TO EAST CROSS-SECTION: SOUTHERN WELLS

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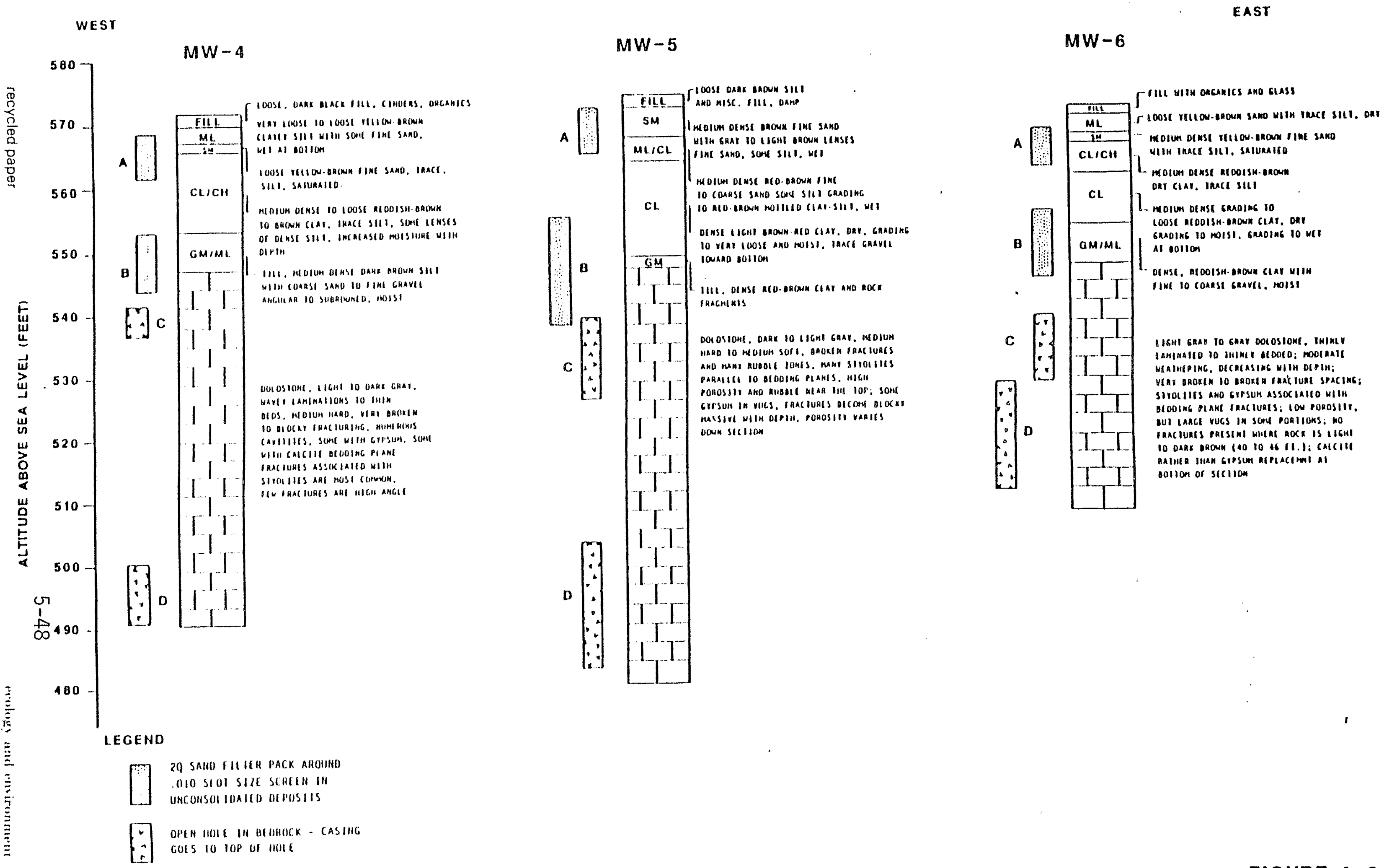

FIGURE 4-6

SUBSURFACE WEST TO EAST CROSS-SECTION: NORTHERN WELLS

LASALLE AREA GROUNDWATER MONITORING PROGRAM, NIAGARA FALLS, N.Y.

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TABLE 4-1

WATER LEVELS AND WELL DESCRIPTIONS

WELL NUMBER	WATER BEARING ZONE	SCREENED DEPTH OR OPEN HOLE (Feet)	GROUNDWATER ELEVATION *
MW1A	Overburden	8 - 13	569.67
MW1B	Regolith	17.5 - 22.5	570.03
MW1C	Upper Bedrock Fracture Zone	30 - 33	562.81
MW1D	Lower Bedrock Fracture Zone	61.0 - 71.0	564.90
MW2A	Overburden	11 - 16	565.06
MW2B	Regolith	21 - 26	560.90
MW2C	Upper Bedrock Fracture Zone	30 - 33	563.94
MW2D	Lower Bedrock Fracture Zone	68.0 - 75.0	562.48
MW3AA	Overburden	2 - 7	566.13
MW3A	Overburden	11.5 - 16.5	561.71
MW3B	Regolith	19.5 - 24.5	557.57
MW3C	Upper Bedrock Fracture Zone	30.5 - 37	560.64
MW3D	Lower Bedrock Fracture Zone	48 - 55	559.23
MW4A	Overburden	5.5 - 10.5	567.04
MW4B	Regolith	21 - 26	551.80
MW4C	Upper Bedrock Fracture Zone	30 - 35	550.90
MW4D	Lower Bedrock Fracture Zone	71.5 - 82.0	556.90
MW5A	Overburden	5 - 10	568.25
MW5B	Regolith	25.0 - 34.5	562.25
MW5C	Upper Bedrock Fracture Zone	35 - 48	562.70
MW5D	Lower Bedrock Fracture Zone	72 - 92	562.65
MW6A	Overburden	4.5 - 9.5	569.04
MW6B	Regolith	22.5 - 27.5	561.32
MW6C	Upper Bedrock Fracture Zone	33 - 44	561.41
MW6D	Lower Bedrock Fracture Zone	44 - 61	562.48
NFB-9	Regolith	22 - 24	559.11
NFB-10	Regolith	23 - 25	560.29

* Groundwater elevations measured in feet above the USGS Mean Sea Level Datum, all elevations measured the week of 5/12/86.

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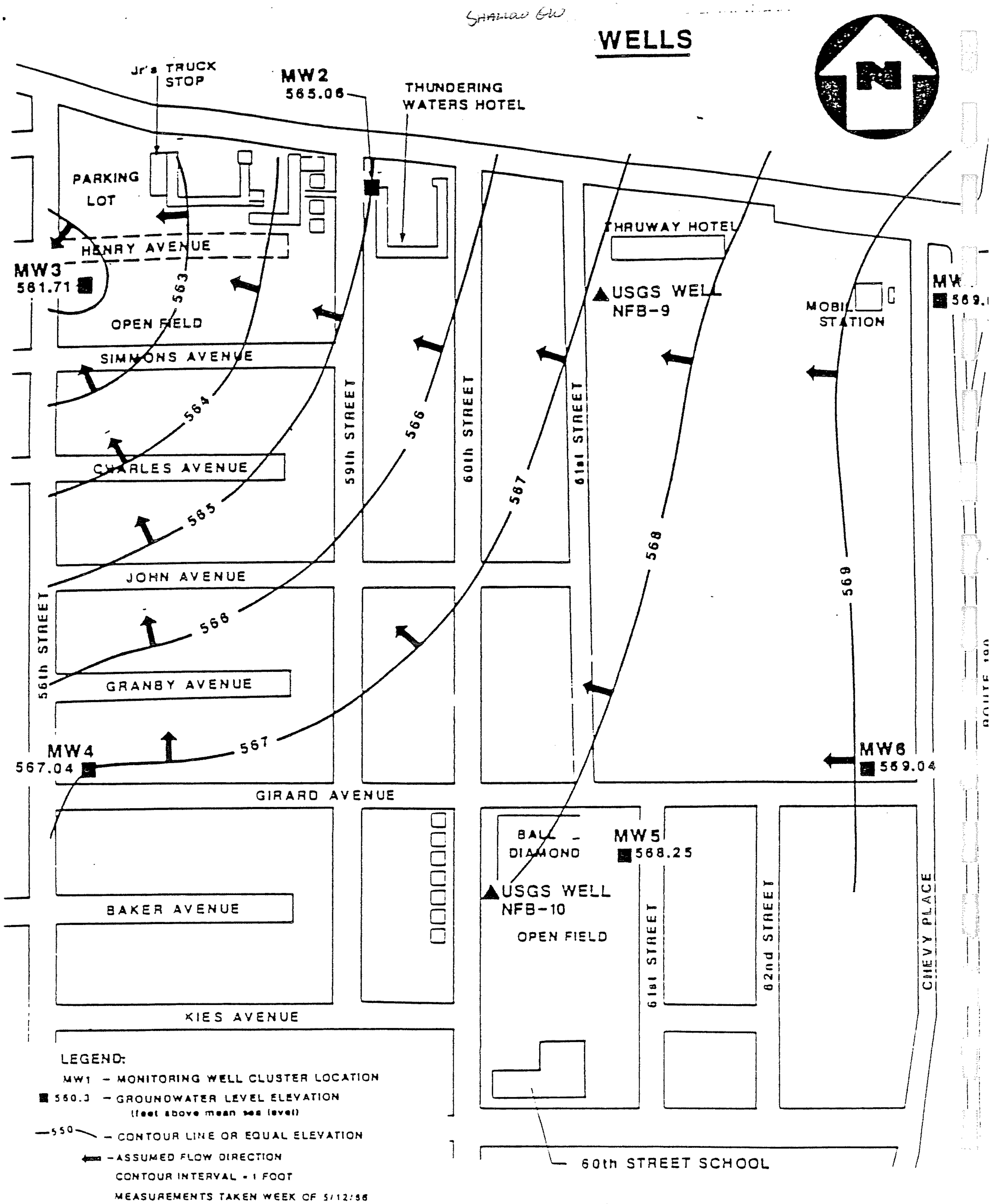

FIGURE 4-3

POTENTIOMETRIC SURFACE CONTOUR MAP

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NIAGARA FALLS, N.Y.

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(MW4B) to +570.03 (MW1B). A computer generated groundwater potentiometric contour map (figure 4-8) indicates water to be flowing in a southwestern direction. The contour map is based on a limited number of data points and assumes a continuous bedrock surface, although the bedrock surface within the study area may not be continuous because of the John Avenue sewer, a 42 inch diameter sanitary and storm sewer that bisects the study area at an elevation of +550 feet. It is situated approximately 400 feet north of clusters four through six and 400 feet south of clusters one through three. Resulting interference caused by the sewer construction may have numerous ramifications on the hydrology of the area. One such effect would be the creation of a groundwater sink causing groundwater to flow towards the sewer excavation and to be channeled in a western downgradient direction. The creation of such a sink would also have the effect of limiting contaminant flow southward as far as John Avenue. The restructuring of normal groundwater flow patterns at the bedrock surface might also have an effect on the recharge of deeper fracture zones. This would be dependent on the vertical transmissivity (water transporting ability) of the Lockport in the study area.

4.2.4 Fractured Rock Aquifers

The uppermost units of bedrock in the study area are the Lockport Dolomite and the Rochester Shale. For the purposes of this investigation only two upper fracture zones of the Lockport were monitored. The Lockport is a crystalline to coarse grained dolostone with alternating massive and thinly bedded sequences. Fracturing within the dolostone is dominated by bedding plane fractures and joints. Vertical fracturing is common in the upper 10 to 15 feet of the formation, but has a rare occurrence in deeper sections.

Fractures and joints are the most efficient routes for the bedrock to transmit water. The permeability of the fracture zones can be locally increased by variation in fracture intensity and by solution enlargements of fractures and cavities. Potential water bearing fractures may be hydraulically separated by massive sequences of dolostone inhibiting vertical water movement. Existing data by a Woodward and Clyde Consultants study indicates downward migration exists within the Lockport[4]. Richard H. Johnston of the USGS however, reports seven distinct and separate water bearing zones in the Lockport.[3]

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Regolith Zone

WELLS

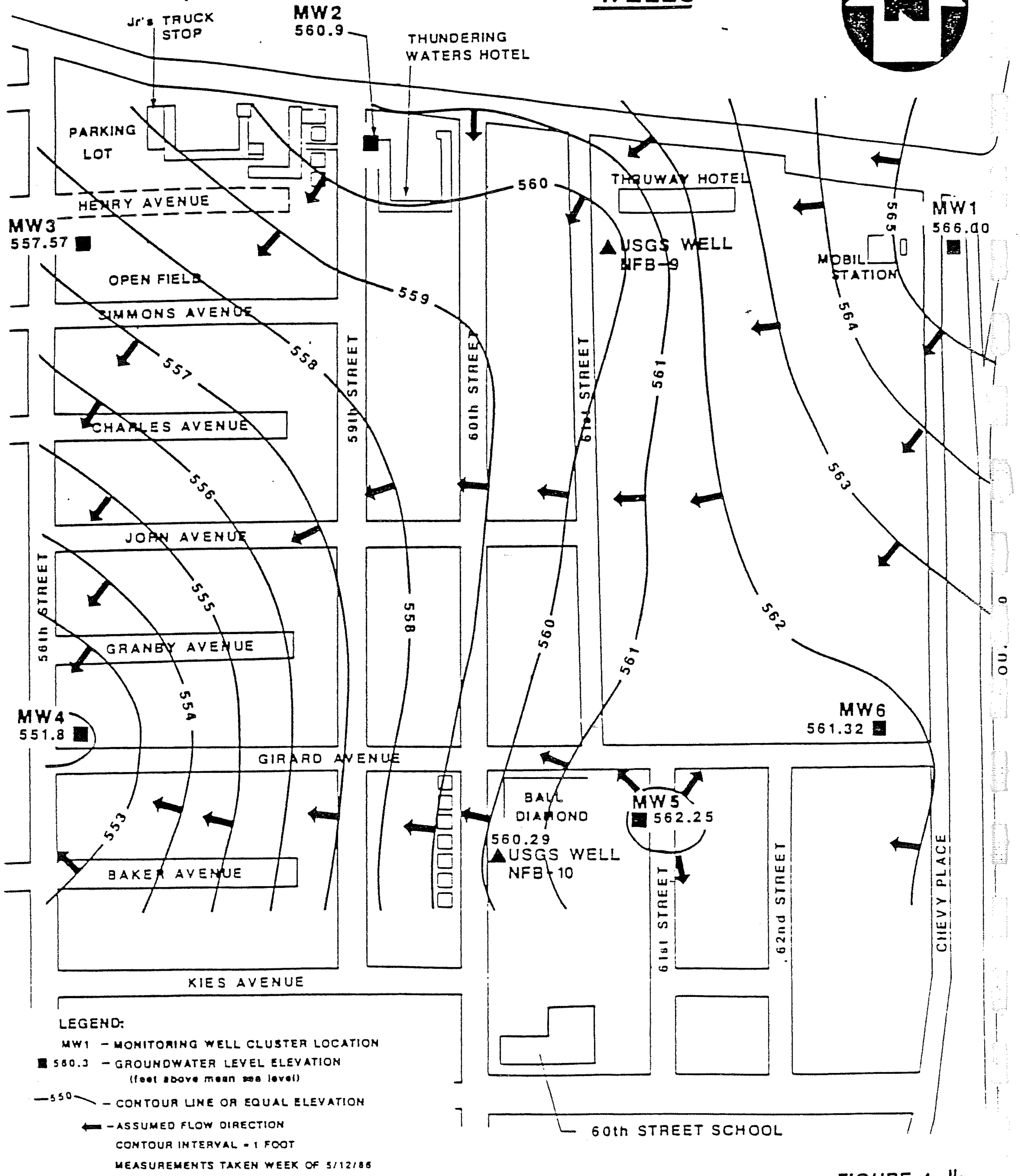

FIGURE 4-4

POTENTIOMETRIC SURFACE CONTOUR MAP

LASALLE AREA

GROUNDWATER MONITORING PROGRAM

NIAGARA FALLS, N.Y.

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Fracture zones were identified for this study by a gain or loss of drilling water and core evaluation. Evaluation of rock cores considered the following data: vertical or horizontal fracture orientation; extent of weathering; percentage of core recovered and the core's rock quality designation (RQD) (a measure of how broken the rock is). In some cases a standard could not be maintained for the determination of fracture zones. A major cause for this dilemma was the lack of lateral continuity of fractures between C and D wells of the same cluster. However, this method of core analysis was a major determinating factor for all well design. Twelve wells were drilled into the Lockport to monitor the two upper fracture zones. These wells are designated as C (first encountered fracture zone) and D (second encountered fracture zone).

4.2.5 Upper Fracture Zone Aquifer

Six wells penetrated the upper fracture zone within the study area to monitor groundwater quality and flow. The upper fracture zone is tentatively identified as the "C" fracture zone of Woodward and Clyde Consultants, (1984). The C zone, if this assumption is correct, has a wide lateral extent and may provide a good record of groundwater quality. The upper fracture zone was generally found within the upper ten to fifteen feet of bedrock. Groundwater elevations range from +550.99 feet (MW4C) to +563.94 feet (MW2C). A complete listing of groundwater elevations can be found in Table 4-1. A computer generated potentiometric contour map for type C wells (Fig. 4-9) shows a similar trend as is developed in the B type well contour map. A southwest direction of groundwater flow is observed in the western half of the map which mimics the B type well contour map. The eastern half is more strongly oriented southward. The mimicking of the B type well map may be caused by three factors:

1. Transmissivity between the upper fracture zone and bedrock surface.

2. The John Avenue sewer excavation has locally increased transmissivity between the upper fracture zone and bedrock surface such that flow characteristics are similar.

3. The fracture zone is a discrete isolated unit and observed similarities are the result of their close proximity and small differences in hydraulic gradient.

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UPPER BEDROCK FRACTURE ZONE

WELLS

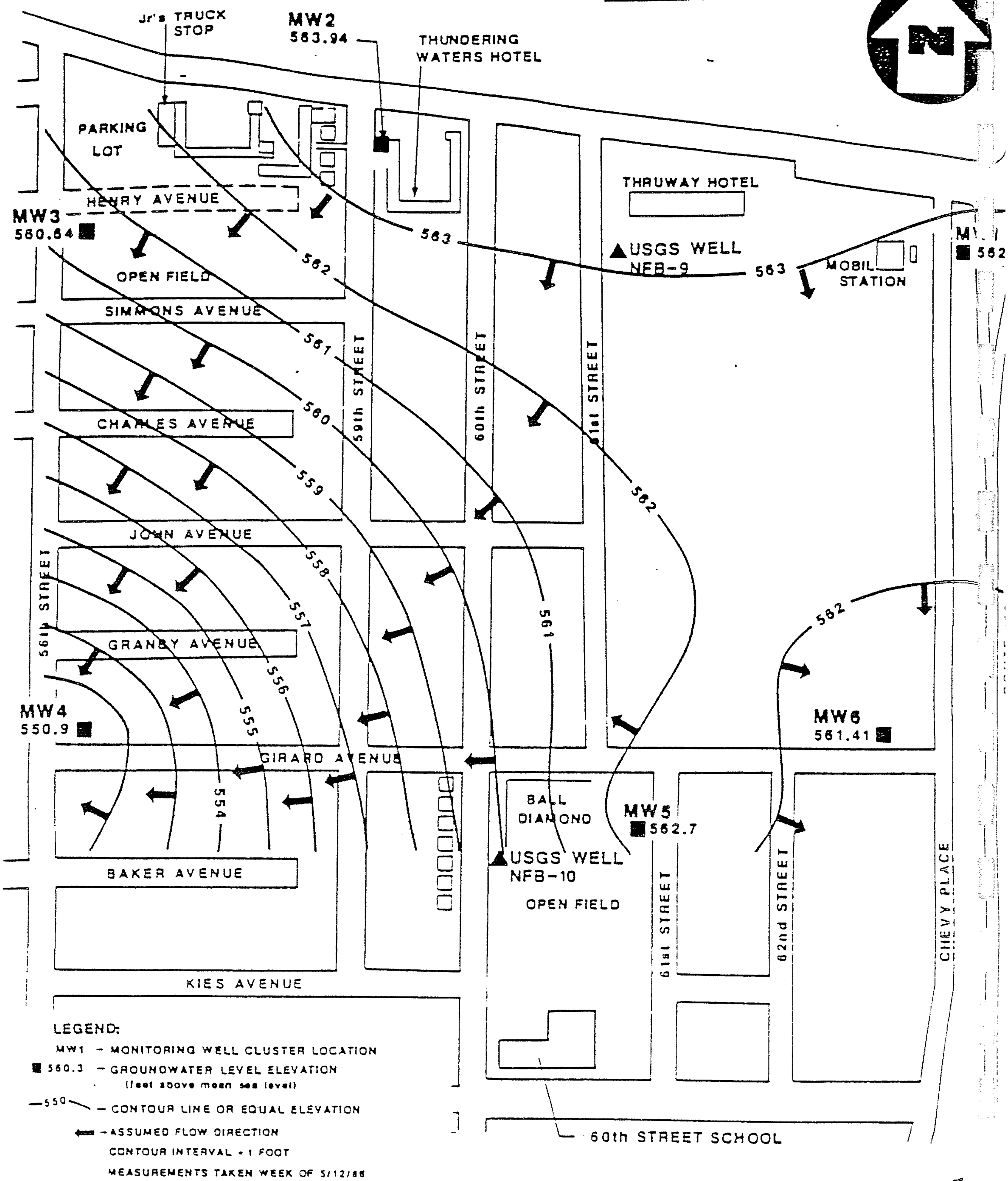

FIGURE 4-5

POTENTIOMETRIC SURFACE CONTOUR MAP

LASALLE AREA

GROUNDWATER MONITORING PROGRAM

NIAGARA FALLS, N.Y.

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Limited data in the area of the John Avenue sewer has made the sewer's actual role in the flow observed in B and C wells unclear. The densely fractured nature of the bedrock surface and the high degree of weathering and dissolution common in carbonate rocks favors a hypothesis of groundwater movement between the bedrock surface and the upper fracture zone.

4.2.6 Lower Fracture Zone Aquifer

The lower fracture zone was investigated by installing six monitoring wells. The premise for monitoring the lower fracture zone was that if the lower fracture zone is an isolated and discrete water bearing zone (Johnson, 1964), then water quality should be uncontaminated by overlying surface sources.

The lower fracture zone shows similarities in elevations to the D fracture zones found in the Necco Park study done by Woodward-Clyde Consultants. This relationship is tentative for the following reasons:

1. Woodward and Clyde's fracture evaluation techniques site loss of drilling water as prima facie evidence for encountering a fracture zone (only in well MW6D was there significant water loss in this study).

2. The lower fracture zone was encountered at elevations which were stratigraphically different from wells done for the Woodward-Clyde 1984 study.

3. The lack of fracture correlation between C and D well cores done for this study.

Groundwater elevations for the lower fracture zone range from +556.91 feet (MW4D) to +564.91 feet (MW1D). A computer generated potentiometric contour map for all D type wells (Figure 4-10) shows a westward direction of water flow. This pattern is different from the pattern developed for C wells, possibly indicating the hydrologic uniqueness of the lower fracture zone. This westward flow direction may indicate influence from the New York Power Authority conduits.

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LOWER BEDROCK FRACTURE ZONE

WELLS

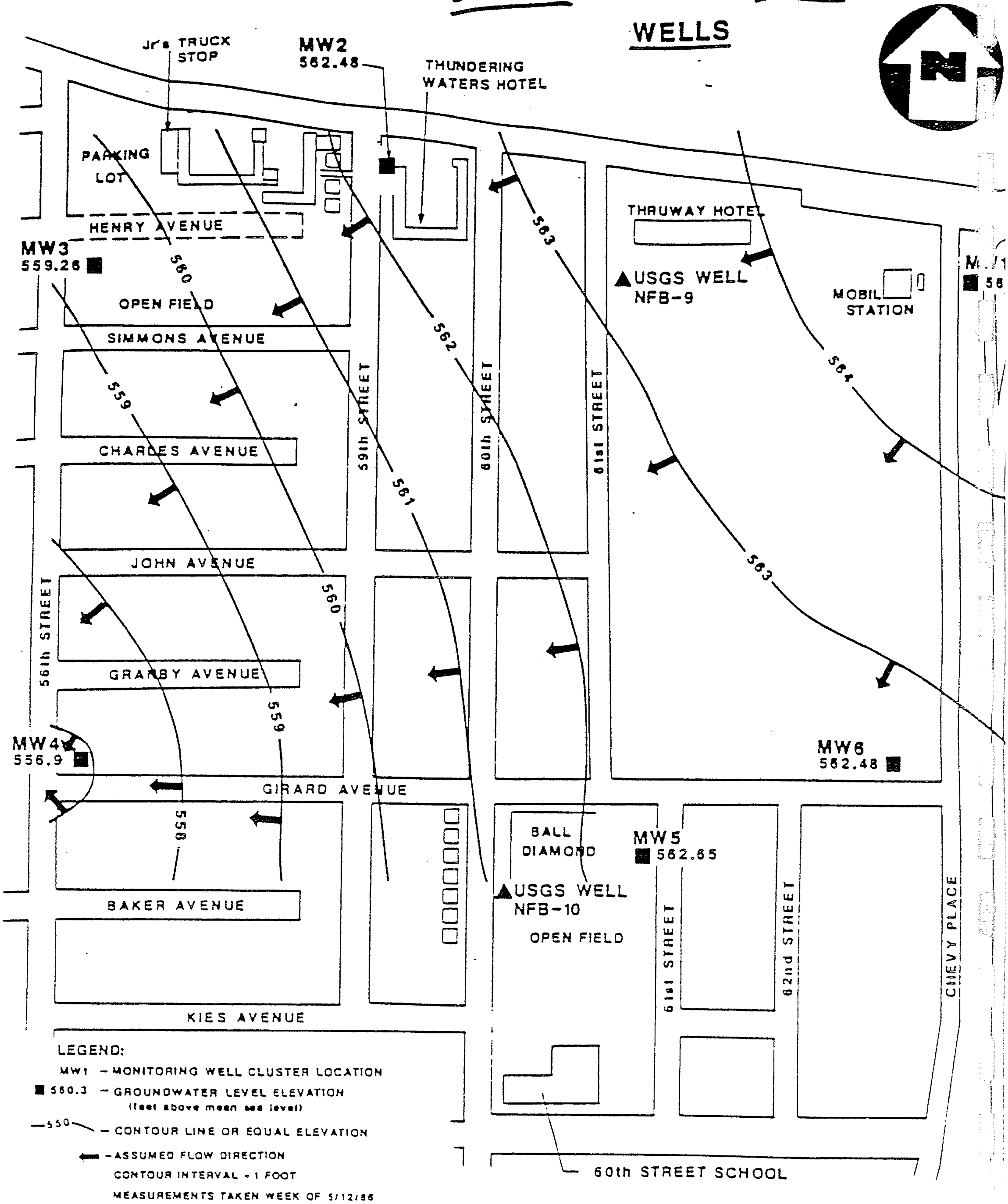

FIGURE 4-6

POTENTIOMETRIC SURFACE CONTOUR MAP

LASALLE AREA

GROUNDWATER MONITORING PROGRAM

NIAGARA FALLS, N.Y.

5-56

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5.0 METHODOLOGY

The soil and groundwater sampling program was designed to monitor the groundwater quality, soil chemistry and groundwater flow in the study area. The strategy for the investigation involves well installation and soil and groundwater sampling. Wells were placed at key locations in the study area and installed to monitor important water bearing strata.

This report includes the findings for 24 soil samples collected during the installation of six monitoring well clusters during the period of October 30, 1985 to May 8, 1986. Also included are the findings for the groundwater sampling of May 14-16, 1986 from 25 EPA wells and USGS wells NFB-9 and NFB-10. The groundwater sample analysis results are compared to three previous groundwater samplings of clusters one, two and three. All samples were analyzed for the full range of HSL compounds plus other parameters of interest.

From each borehole one soil sample was obtained for chemical analysis. Soil sampling depths of four to six and eight to ten feet were selected on the basis of the depths of basements in residential dwellings and the geologic makeup of the area.

This section describes the methodology for all soil and groundwater sampling. Tables 5-1 and 5-2 provide sample descriptions by case number and sample date.

5.1 Soil Sampling Methodology

Soil samples were obtained during the study from each well cluster. The samples were similar in composition at all locations, being generally a loose to medium dense, light brown silty fine sand grading to a dense red brown silty clay. Samples were collected in conformance with the NUS Corporation Operating Guidelines Manual using a stainless steel split spoon with either a stainless steel or teflon liner to prevent the release of volatile organic compounds. Each sample was collected in three 8-ounce capacity glass jars and one 120-milliliter capacity glass bottle. Sample blanks were obtained from the EPA Laboratory in Edison, New Jersey and shipped with the samples as quality assurance/quality control (QA/QC) checks. The sample blanks consisted of two 40-milliliter capacity glass bottles consisting of deionized, distilled water. Periodic rinsate samples were also taken from sampling equipment in the field to ensure the effectiveness of equipment decontamination procedures. All samples were shipped for overnight delivery to EPA contract laboratories. Samples were analyzed for the standard Hazardous Substance List (HSL) parameters plus several other parameters of interest under special analytical services (SAS) including ammonia nitrogen (NH_3), total organic carbon (TOC), total inorganic carbon (TIC), total organic halogens (TOX), specific gravity, hexavalent chromium (Cr^{+6}), total recoverable phenolics, and cyanide (CN^{-1}).

5.2 Groundwater Sampling Methodology

At the conclusion of drilling activities all EPA monitoring wells and USGS wells NFB-9 and NFB-10 were sampled. Samples were collected using a stainless steel bottom loading bailer and a dedicated nylon cable in conformance with the NUS Corporation Superfund Division Operating Guidelines Manual. In order to obtain a representative sample, each well was evacuated and its discharged water monitored for pH and conductivity. Once the pH and conductivity stabilized the well was sampled, provided at least one well volume had been removed. The samples were collected in three 80-ounce capacity amber glass bottles, two 1-liter capacity amber glass bottles, five 1-liter capacity polyethylene bottles and two 40-milliliter capacity glass bottles. Sample blanks were obtained from the EPA Laboratory in Edison, New Jersey and shipped with the samples as quality assurance/quality control (QA/QC) checks. Two duplicate samples were collected for QA/QC purposes. Periodic rinsate samples were also taken from sampling equipment in the field to ensure that effective equipment decontamination procedures were followed. All samples were analyzed for the standard Hazardous Substance List (HSL) parameters plus several other parameters of interest including ammonia nitrogen (NH_3), total inorganic carbon (TIC), total organic carbon (TOC), total organic halogens (TOX), specific gravity, hexavalent chromium (Cr^{+6}), total recoverable phenolics, and cyanide (CN^{-1}).

TABLE 5-1

SOIL SAMPLE SUMMARY
LASALLE AREA GROUNDWATER MONITORING PROGRAM
NIAGARA FALLS, NEW YORK

Sample Number	Date Sampled	Description
MWI-A	10/30/85	Split spoon soil, sample 8 to 10 feet. Cluster 1, monitoring well A.
MW1-B	10/31/85	Split spoon soil, sample 8 to 10 feet. Cluster 1, monitoring well B.
NYD2-B1	11/1/85	Field Blank, Cluster 1 monitoring well.
Soil 1	11/18/85	Split spoon soil, sample 8 to 10 feet. Cluster 1, monitoring well C.
Soil 2	11/18/85	Split spoon soil, sample 8 to 10 feet. Cluster 1, monitoring well D.
BL1	11/18/85	Field Blank.
Soil 3	11/19/85	Split spoon soil, sample 8 to 10 feet. Cluster 3, monitoring well B.
BLK 1	11/19/85	Field Blank.
Soil 4	11/18/85	Split spoon soil, sample 8 to 10 feet. Cluster 3, monitoring well A.
BL 3	11/20/85	Field Blank.
Soil 5	11/21/85	Split spoon soil, sample 8 to 10 feet. Cluster 3, monitoring well C.
BL 4	11/21/85	Field Blank.
S4	12/6/85	Split spoon soil, sample 3 to 5 feet. Cluster 3, monitoring well D.
RIN	12/6/85	Rinsate sample, Cluster 3 monitoring well D.
BLR	12/6/85	Field Blank.
Soil 7	12/16/85	Split spoon soil, sample 8 to 10 feet. Cluster 2, monitoring well B.

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TABLE 5-1 (CONT'D)

SOIL SAMPLE SUMMARY
LASALLE AREA GROUNDWATER MONITORING PROGRAM
NIAGARA FALLS, NEW YORK

Sample Number	Date Sampled	Description
RIN2	12/16/85	Rinsate sample, Cluster 2 monitoring well B.
B2	12/16/85	Field Blank.
BL5	12/18/85	Field Blank.
S8	12/18/85	Split spoon soil, sample 8 to 10 feet. Cluster 2, monitoring well D.
S9	12/18/85	Split spoon soil, sample 8 to 10 feet. Cluster 2, monitoring well A.
S10	12/18/85	Split spoon soil, sample 8 to 10 feet. Cluster 2, monitoring well C.
RIN3	12/18/85	Rinsate sample, Cluster 2, monitoring well C.
BLR3	12/18/85	Field Blank.
NYD2-4D	3/31/86	Split spoon soil, sample 4 to 6 feet. Cluster 4, monitoring well D.
4D-BLK	3/31/86	Field blank, Cluster 4, monitoring well D.
NYD2-4B	4/1/86	Split spoon soil, sample 4 to 6 feet, Cluster 4, monitoring well B.
4B-BLK	4/1/86	Field blank, Cluster 4, monitoring well B.
NYD2-4C	4/3/86	Split spoon soil, sample 4 to 6 feet, Cluster 4, monitoring well C.
NYD-4A	4/3/86	Split spoon soil, sample 4 to 6 feet, Cluster 4, monitoring well A.
4A/C BLK	4/3/86	Field blank, Cluster 4 monitoring well A and C.
MW5D	4/3/86	Split spoon soil, sample 4 to 6 feet, Cluster 5, monitoring well D.

TABLE 5-1 (CONT'D)

SOIL SAMPLE SUMMARY
LASALLE AREA GROUNDWATER MONITORING PROGRAM
NIAGARA FALLS, NEW YORK

Sample Number	Date Sampled	Description
B1	4/8/86	Field blank, Cluster 5, monitoring well D.
MW5C-S	4/15/86	Split spoon soil, sample 4 to 6 feet, Cluster 5, monitoring well C.
MW6D-S	4/15/86	Split spoon soil, sample 4 to 6 feet, Cluster 6, monitoring well D.
B2	4/15/86	Field blank, Clusters 5 and 6, monitoring wells 5C and 6D.
MW5A-S	4/17/86	Split spoon soil, sample 4 to 6 feet, Cluster 5, monitoring well A.
MW5B-S	4/17/86	Split spoon soil, sample 4 to 6 feet, Cluster 5, monitoring well B.
B4	4/17/86	Field blank, Cluster 5, monitoring well A and B.
MW6A-S	4/24/86	Split spoon soil, sample 4 to 6 feet Cluster 6, monitoring well A.
MW6B-S	4/24/86	Split spoon soil, sample 4 to 6 feet, Cluster 6, monitoring well B.
MW6C-S	4/24/86	Split spoon soil, sample 4 to 6 feet Cluster 6, monitoring well C.
MW6-BLKS	4/24/86	Field blank, Cluster 6, monitoring wells A,B and C.
MW6BRIN-S	4/24/86	Rinsate sample, Cluster 6.
MW6BRIN-B	4/24/86	Rinsate Blank, Cluster 6.

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TABLE 5-2

GROUNDWATER SAMPLE SUMMARY
LASALLE AREA GROUNDWATER MONITORING PROGRAM
NIAGARA FALLS, NEW YORK
CASE #5754

Sample Number	Date Sampled	Description
MW1A	5/14/86	Groundwater sample taken from Cluster 1, monitoring well A.
MW1B	5/14/86	Groundwater sample taken from Cluster 1, monitoring well B.
MW1C	5/14/86	Groundwater sample taken from Cluster 1, monitoring well C.
MW1D	5/14/86	Groundwater sample taken from Cluster 1, monitoring well D.
MW1-QA	5/14/86	QA duplicate groundwater sample taken from Cluster 1, monitoring well D.
MW2A	5/13/86	Groundwater sample taken from Cluster 2, monitoring well A.
MW2B	5/13/86	Groundwater sample taken from Cluster 2, monitoring well B.
MW2C	5/13/86	Groundwater sample taken from Cluster 2, monitoring well C.
MW2D	5/13/86	Groundwater sample taken from Cluster 2, monitoring well D.
MW2-QA	5/13/86	QA duplicate groundwater sample taken from Cluster 2, monitoring well D.
MW3AA	5/13/86	Groundwater sample taken from Cluster 3, monitoring well AA.
MW3A	5/13/86	Groundwater sample taken from Cluster 3, monitoring well A.
MW3B	5/13/86	Groundwater sample taken from Cluster 3, monitoring well B.
MW3C	5/12/86	Groundwater sample taken from Cluster 3, monitoring well C.

TABLE 5-2 (CONT'D)

GROUNDWATER SAMPLE SUMMARY
LASALLE AREA GROUNDWATER MONITORING PROGRAM
NIAGARA FALLS, NEW YORK
CASE #5754

Sample Number	Date Sampled	Description
MW3D	5/12/86	Groundwater sample taken from Cluster 3, monitoring well D.
MW3-QA	5/12/86	QA duplicate groundwater sample taken from Cluster 3, monitoring well D.
MW4A	5/12/86	Groundwater sample taken from Cluster 4, monitoring well A.
MW4B	5/12/86	Groundwater sample taken from Cluster 4, monitoring well B.
MW4C	5/12/86	Groundwater sample taken from Cluster 4, monitoring well C.
MW4D	5/12/86	Groundwater sample taken from Cluster 4, monitoring well D.
MW4-QA	5/12/86	QA duplicate groundwater sample taken from Cluster 4, monitoring well D.
MW5A	5/13/86 5/14/86 (SAS only)	Groundwater sample taken from Cluster 5, monitoring well A.
MW5B	5/13/86	Groundwater sample taken from Cluster 5, monitoring well B.
MW5-QA	5/13/86	QA duplicate groundwater sample taken from Cluster 5, monitoring well B.
MW5C	5/13/86	Groundwater sample taken from Cluster 5, monitoring well C.
MW5D	5/13/86	Groundwater sample taken from Cluster 5, monitoring well D.
MW6A	5/14/86	Groundwater sample taken from Cluster 6, monitoring well A.
MW6B	5/14/86	Groundwater sample taken from Cluster 6, monitoring well B.

TABLE 5-2 (CONT'D)
GROUNDWATER SAMPLE SUMMARY
LASALLE AREA GROUNDWATER MONITORING PROGRAM
NIAGARA FALLS, NEW YORK
CASE #5754

Sample Number	Date Sampled	Description
MW6-QA	5/14/86	QA duplicate groundwater sample taken from Cluster 6, monitoring well B.
MW6C	5/14/86	Groundwater sample taken from Cluster 6, monitoring well C.
MW6D	5/14/86	Groundwater sample taken from Cluster 6, monitoring well D.
NFB9	5/13/86	Groundwater sample taken from USGS well NFB9.
NFB10	5/13/86	Groundwater sample taken from USGS well NFB10.
MW2-RIN	5/13/86	Rinsate sample taken from the bailer used to sample Cluster 2, monitoring well C.
MW4-RIN	5/12/86	Rinsate sample taken from the bailer used to sample Cluster 4, monitoring well C.
MW6-RIN	5/14/86	Rinsate sample taken from the bailer used to sample Cluster 6, monitoring well B.
RIN-BLK2	5/14/86	Rinsate Blank for sample MW2-RIN.
RIN-BLK4	5/12/86	Rinsate Blank for sample MW4-RIN.
RIN-BLK6	5/14/86	Rinsate Blank for sample MW6-RIN.
BLK1	5/12/86	Field Blank
BLK2	5/13/86	Field Blank
BLK3	5/14/86	Field Blank

6.0 FINDINGS

The following sections discuss the results of soil and groundwater sampling conducted during the groundwater investigation of the LaSalle Residential Area in Niagara Falls, New York. Section 6.1 presents results for the soil samples collected between October 30, 1985 and April 24, 1986 during installation of the EPA monitoring wells. Section 6.2 provides a discussion of the results for 27 groundwater samples collected from all EPA monitoring wells and USGS wells NFB-9 and NFB-10 between May 12 and 14, 1986. Section 6.3 provides a comparison of the May groundwater sampling results with previous sampling results for wells in the LaSalle Residential Area.

6.1 Soil Findings

Twenty-four soil samples were collected for laboratory analysis during the drilling activities. The only organic compound detected in these samples was toluene. Concentrations of toluene range from trace amounts in monitoring wells MW1B, MW2B and MW2C to 210 ug/l in monitoring well MW4B. The results for toluene from the remaining soil samples are: 20 ug/kg in MW1A, 7.5 ug/kg in MW1C, 11 ug/kg in MW1D, 8.9 ug/kg in MW3A, 13 ug/kg in MW3B, 16 ug/kg in MW3C, 85 ug/kg in MW4A, 21 ug/kg in MW4C, 44 ug/kg in MW4D, 33 ug/kg in MW5A, 13 ug/kg in MW5B, 18 ug/kg in MW5C, 20 ug/kg in MW5D, and 6 ug/kg in MW6D. Soil samples from MW6A, MW6B and MW6C did not pass quality assurance and quality control standards. Samples from wells MW2A and MW2D showed no presence of toluene in the soil.

All inorganic compounds were within ranges expected to be found in soils in the area. The SAS parameters produced the following ranges of results: ammonia-nitrogen 0.348 to 490 ug/kg, total inorganic carbon 11.4 to 14500 mg/kg, total organic carbon 2.8 to 9000 mg/kg, total organic halogens less than 20 mg/kg, specific gravity 1.73 to 3.1 and hexavalent chromium less than 0.33 mg/kg. Total recoverable phenolics and cyanide were detected, but in trace amounts.

6.2 Groundwater Findings

During May 12-14, 1986 all EPA monitoring wells in the LaSalle Residential Area and two USGS wells, NFB-9 and NFB-10, were sampled. Results from this sampling reveal that measurable organic compounds were restricted to two locations, monitoring well cluster two and USGS well NFB-9. At cluster two, only two wells were affected, MW2B and MW2C. The following compounds and concentrations were found: vinyl chloride in well MW2B at 110 ug/l, in MW2C at 160 ug/l, and in NFB-9 at 24 ug/l; carbon disulfide in well MW2C at 5 ug/l; 1,1-dichloroethene in well MW2B at 5 ug/l; trans-1,2-dichloroethene in wells MW2B at 34 ug/l, in MW2C at 33 ug/l, and in NFB-9 at 5 ug/l; trichloroethene in well MW2B at 12 ug/l; and benzene in well MW2B at 14 ug/l and in MW2C at 7 ug/l.

Semivolatiles, pesticides and polychlorinated biphenols (PCB's) were not detected in any of the groundwater samples above trace amounts.

Inorganic and other SAS results did not indicate any levels of concern.

6.3 Comparison to Previous Sampling Results

The EPA wells in the LaSalle Residential Area have been sampled on four separate occasions. Between January 27 and 30, 1986 all completed wells at Clusters 1, 2 and 3 were sampled. On April 10, 1986 the wells at Cluster 2 were sampled for volatile organic compounds and cyanide. Between April 14 and 16, 1986 all wells at Clusters 1, 2 and 3 were sampled. Most recently, all wells at Clusters 1 through 6 were sampled between May 12 and 14, 1986. During each of these sampling events the measurable organic contamination occurred primarily at Cluster 2 and at USGS well NFB-9. Figure 6-1 indicates the variation of volatile organic concentrations by sampling event. This figure illustrates that volatile organic contamination occurs primarily in wells MW2B, MW2C and NFB-9. The contaminants detected in wells MW2B, MW2C, and NFB-9 were not present in MW2A. The lack of contamination in well MW2A indicates that the lacustrine clay layer is probably an effective barrier to upward migration of contaminants in the LaSalle Residential Area.

Figure 6-2 indicates the variation in concentration of semi-volatiles, pesticides, and cyanide by sampling event. This figure illustrates, as does figure 6-1, that contamination occurs at highest concentrations in monitoring well MW2B. Figure 6-2 also indicates contaminants have been detected at low levels in wells MW1B, MW2C, MW3AA, and MW6A, but not in a consistent manner.

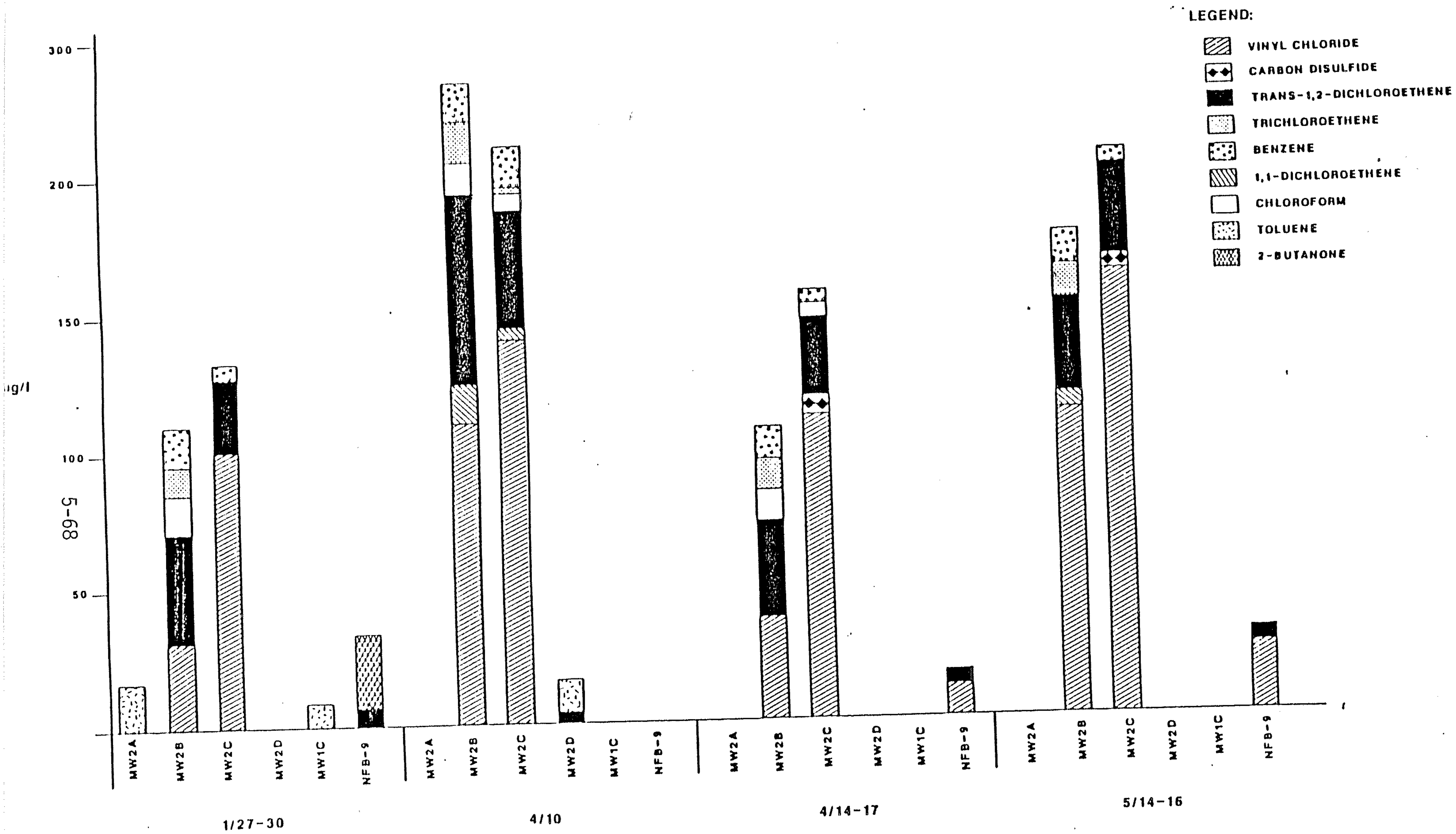

FIGURE 4-7

VARIATIONS OF VOLATILE ORGANIC CONCENTRATIONS PER SAMPLING EVENT

LaSALLE AREA GROUNDWATER MONITORING PROGRAM

NIAGARA FALLS, N.Y.

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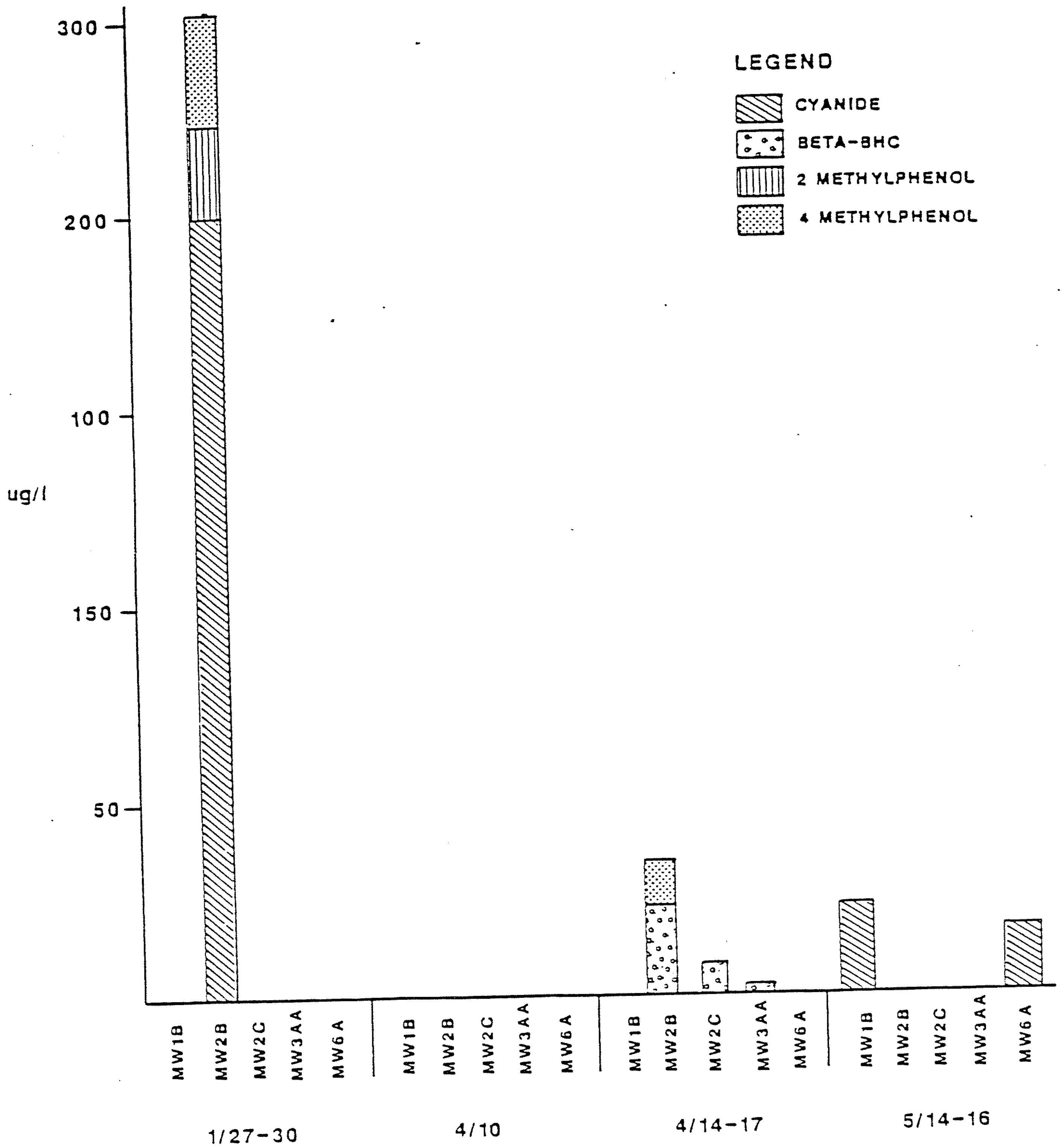

VARIATIONS OF SEMI-VOLATILES, PESTICIDES AND CYANIDE PER SAMPLING TRIP EVENT
LaSALLE AREA GROUNDWATER MONITORING PROGRAM
NIAGARA FALLS, N.Y.

FIGURE 4-8

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LIST OF REFERENCES

1. Buehler, E.J. and Tesmer, I.H. 1963. Geology of Erie County. Buffalo Society of Natural Resources Bulletin, V. 21, no. 3: 9-10.

2. Golder Associates, 1985. Hydrogeologic Assessment of the Necco Park Waste Disposal Facilities, Niagara Falls, New York. Report to Niagara River Steering Committee Ontario Ministry of the Environment.

3. Johnston, R.H. 1964. Groundwater in the Niagara Falls Area, New York with Emphasis on the Water Bearing Characteristics of the Bedrock. State of New York Conservation Department Water Resources Commission. Bulletin GW-53.

4. Woodward-Clyde Consultants, 1984. Site Assessment Studies, Necco Park. Report to E.I. Dupont De Nemours and Company Incorporated.

APPENDIX C

Monitoring Well Installation and Construction

Well Construction Details

Monitoring Well Installation and Construction

Monitoring wells were installed in the top of the lacustrine sequence (clay zone), the regolith zone and the first two fracture zones encountered in competent bedrock. One monitoring well boring at each cluster location had continuous split spoon samples collected to refusal depth to provide a profile of the geologic sequence and a basis for well design. Each bedrock monitoring well boring was continuously cored to a point at least two feet below the fractured zone. All samples were labeled and boxed for storage and future reference.

Description of Stratigraphic Intervals Used for Monitoring

At each Phase I well cluster location a minimum of four wells were installed to monitor, the groundwater at the top of the lacustrine sequence, the regolith zone, the uppermost fracture zone of competent bedrock and the next deeper fracture zone. Available data indicate that each zone function in a hydraulically independent manner. The proposed monitoring well array was intended to test the validity of this premise utilizing analysis and interpretation of hydrogeologic and chemical data.

Top of the Lacustrine sequence (clay) wells were installed to monitor shallow or perched groundwater conditions.

The regolith zone was investigated to determine its potential as a route of concern for contaminant migration. The hydrologic characteristics and extent of this zone had not been determined to date and its potential to transmit water was in question.

The upper bedrock fracture zone was described in a previous investigation as 10 to 15 feet of relatively densely fractured dolostone. This zone is potentially a major route for groundwater movement in the area.

The next lowest fracture zone in the Lockport Dolomite was investigated to determine the quality of the groundwater in that zone and the potential for interconnection between overlying zones.

If contamination is present in the lower bedrock unit additional studies would have to be implemented to determine the extent of vertical contaminant migration.

Top of Clay Wells

The uppermost groundwater encountered within the overburden is tentatively identified in the vicinity of the potential point sources as a shallow groundwater table residing above the lacustrine silt and clay. The well screen was set to monitor the interval immediately above the lacustrine sequence. For wells intended to monitor this groundwater system, the following construction sequence was followed:

1. A six-inch or larger borehole was advanced using a hollow-stem auger. Soil samples were used to provide a basis for determining the top of the lacustrine sequence.

2. A two-inch stainles-steel well screen was emplaced in the hole and sand packed at least two feet above the well screen or to the base of any fill material. Screen length, slot size, and sand sizing was determined at the well site, according to the nature of the material immediately overlying the lacustrine sequence.

3. A two-foot-thick bentonite seal was emplaced above the sand pack, and a cement-bentonite grout was emplaced above the bentonite seal to the ground surface.

Regolith Wells

For wells intended to monitor the groundwater in the regolith zone, the following construction sequence was followed:

1. A six-inch or larger hole was drilled through the glacial deposits.

2. A six-inch steel casing was emplaced to total depth to maintain open hole during the following operation and to minimize the potential for cross-contamination.

3. An HX core hole was advanced until competent rock is verified and then reamed to at least a five inch diameter.

4. A flush-jointed assembly of two inch stainless-steel well screen and riser pipe of an appropriate length was lowered to total depth, centered and sand packed. Screen length, slot size, and sand-sizing was determined at the well site based upon soil samples and retrieved core. The sand pack was extended to a level at least two feet above the top of the screen and overlain, in turn, by a two-foot section of bentonite and sufficient cement-bentonite grout to fill the remainder of the annulus.

<u>Bedrock Wells - Upper Fracture Zone</u>

For wells intended to monitor the upper fracture zone the following construction sequence was followed:

1. A ten-inch or larger hole was drilled through the glacial deposits and through the regolith zone into competent rock.

2. Ten-inch steel casing was emplaced to the total depth of the drilled hole and functioned to maintain open hole during the following operation.

3. An HX core hole was advanced to a minimum of two feet below the base of the upper fracture zone.

4. A socket, large enough to accomodate a six-inch stainless steel casing, was drilled into competent rock above the upper fracture zone. The casing was emplaced and grouted into position. The ten-inch outer casing was withdrawn as grouting proceeded.

5. The remaining core hole was then reamed to five inches in diameter to total depth.

The well construction of well MW1C differed from standard installation in the following way: a six-inch stainless steel casing was set at 20.8 feet, 9.2 feet above the upper fracture zone. Four inch stainless steel casing was emplaced and grouted at 30.0 feet after reaming the core hole to five inches in diameter. The hole was then reamed to three and one half inches in diameter to 35.0 feet.

Bedrock Wells - Lower Fracture Zone

For wells intended to monitor the lower fracture zone, the following construction sequence was followed:

1. An eighteen-inch hole was drilled through the overburden to competent rock. If refusal was encountered above competent rock a smaller diameter hole was then advanced to the bedrock surface. Reaming with larger diameter drill bits followed the pilot hole until an appropriate size hole was made.

2. Fourteen-inch steel casing was then emplaced or driven to the total depth of the drilled hole and functioned mainly to maintain open hole during the following operation.

3. A socket, large enough to accomodate a twelve inch steel casing was then drilled into competent rock, and the casing emplaced and grouted into position. The fourteen-inch outer casing was then withdrawn as grouting proceeded.

4. An HX core hole was then advanced to at least two feet below the lower fracture zone. The hole was then reamed to ten inches in diameter to at least two feet above the fracture zone.

5. Six-inch casing of stainless steel was then lowered to the bottom of the ten-inch hole, centered and grouted into position.

6. The remaining core hole was then reamed to five inches in diameter to total depth or an appropriate depth below the fracture zone.

Monitoring Well Development

Each well was developed by pumping, flushing with clean water and/or blowing air until a clear sample is obtainable or as designated by the EPA Subcontractor's field operations coordinator.

REFERENCE NO. 2

GROUND WATER IN THE NIAGARA FALLS AREA, NEW YORK

With Emphasis on the Water-Bearing Characteristics of the Bedrock

BY

RICHARD H. JOHNSTON

GEOLOGIST

U.S. GEOLOGICAL SURVEY

STATE OF NEW YORK

CONSERVATION DEPARTMENT

WATER RESOURCES COMMISSION

BULLETIN GW-53

1964

5-78

because studies made on the Lockport may contribute to a better understanding of the occurrence of ground water in bedrock generally. The Queenston Shale and Clinton and Albion Groups are poor aquifers in comparison to the Lockport Dolomite, and less is known of their water-bearing characteristics.

LOCKPORT DOLOMITE

Character and extent

The Lockport Dolomite is the uppermost bedrock formation in about one-third of the Niagara Falls area. Its outcrop area extends from the Niagara escarpment on the north to the southern boundary of the area covered by this report except in two small areas that may be underlain by the Salina Group. (See plate 3.) One of these areas is in the vicinity of the hamlet of Nashville and the other is in the extreme southeast corner. Because of a lack of rock outcrops in these areas the position of the contact between the Lockport and the Salina cannot be accurately determined. However, the Salina Group is not discussed as a separate water-bearing unit in this report because at most only a few feet of it occurs in the area. Continuous exposures of the Lockport are found along the gorge of the Niagara River and along the Niagara escarpment. The formation is about 150 feet thick in the southern part of the area but has been eroded to a thickness of only about 20 feet along the escarpment (pl. 2). The excellent exposures at Niagara Falls (fig. 5), where the Lockport forms the lip of the Falls, are shown in many geology textbooks as a classic example of flat-lying sedimentary rocks. Throughout most of the remainder of the area, which is relatively flat, the Lockport is concealed by a thin cover of glacial deposits.

As its name implies, the Lockport Dolomite consists mainly of dolomite; however, the formation also includes thin beds of limestone and shaly dolomite near the base. The Lockport consists of five lithologic types which, from top to bottom, are:

(a) brownish-gray, coarse- to medium-grained dolomite, locally saccharoidal with thin intervals of curved bedding (algal structures).

(b) gray to dark-gray, fine-grained dolomite, containing abundant carbonaceous partings.

(c) tannish-gray, fine-grained dolomite.

(d) light-gray, coarse-grained limestone containing abundant crinoid fragments (Gasport Limestone Member).

(e) light-gray shaly dolomite, laminated in part (DeCew Limestone Member of Williams, 1919).

Fisher (1960) divides the Lockport Dolomite into six units based on fossils as well as rock types. An excellent discussion of the stratigraphy of the

Lockport, including measured sections in the Niagara Falls area, is given in the recent thesis by Zenger 1/.

The detailed breakdowns by Fisher and Zenger, although helpful for geologic mapping and correlating the Lockport with rocks of similar age elsewhere, are not necessary in descriptions of the water-bearing properties of the formation. For this purpose the Lockport is subdivided as follows (figure 5 and table 1): (1) upper and middle parts of the Lockport, and (2) lower part of the Lockport, including the Gasport Limestone Member and DeCew Limestone Member of Williams (1919).

Most of the beds in the Lockport are described as either "thick" (1 foot to 3 feet) or "thin" (1 inch to 1 foot). However, massive beds up to eight feet thick and very thin beds (1/4 to 1 inch) occur within the formation. The bedding is generally straight, but curved bedding occurs in some places in the upper part of the formation. The curved bedding is caused by dome-shaped algal structures called "stromatolites" (Zenger, p. 140). These reefs (bioherms), which occur as lens-like masses up to 50 feet across and 10 to 20 feet thick, contain no bedding.

Gypsum (calcium sulfate) is common in the Lockport, occurring chiefly as small irregularly shaped masses (commonly 1/2 to 5 inches in diameter) and as selenite. Sulfide minerals, particularly sphalerite (zinc sulfide), galena (lead sulfide), and pyrite (iron sulfide) occur as particles disseminated throughout the formation.

Water-bearing openings

Types.--Ground-water occurs in the Lockport Dolomite in three types of openings: (1) bedding joints which constitute at least seven important water-bearing zones, (2) vertical joints, and (3) small cavities from which gypsum has been dissolved. Of these, the bedding joints are the most important and transmit nearly all the water moving through the formation. The three types of openings were observed in the dewatered excavations for the conduits of the Niagara Power Project. (See the description of the power project in the introduction and the location of the conduits in figure 3.) The rock faces along the four-mile length of the conduits provided an unequaled opportunity to study water-bearing openings in the entire stratigraphic thickness of the Lockport and to observe the lateral extent of these openings for a few thousand feet. At the time the observations were made (July - August 1960), approximately one-third of the length of the conduits was available for inspection by the writer.

1/ Zenger, D. H., 1962, Stratigraphy of the Lockport Formation (Silurian) in New York State: Unpublished doctoral thesis, Cornell University.

The bedding joints, which transmit most of the water in the Lockport, are fractures along prominent bedding planes which have been widened very slightly by solution of the rock. These planar openings persist laterally for distances of at least 3 to 4 miles. The separation along individual bedding joints is small (less than 1/8 inch). However, their continuity makes them effective "conduits" for movement of ground water. The large water-transmitting capacity of the bedding joints was shown by the fact that they supplied nearly all the ground-water seepage entering the conduit excavations. The almost continuous lines of seepage from bedding joints was strikingly apparent in the conduits. Figure 7 shows seepage from two bedding joints.

The bedding joints transmitting ground water comprise at least seven distinct water-bearing zones within the Lockport. These water-bearing zones could be traced laterally for distances of 1 to 4 miles. Figure 8 shows the stratigraphic position and part of the lateral extent of the seven zones. The water-bearing zones have been numbered from 1 to 7 from bottom to top. The three sections shown in figure 8 were surveyed by transit and then correlated on the following basis: (1) lithologic similarities, (2) laterally tracing seepage from individual water-bearing zones, and (3) in the case of section A, the distance above the Rochester Shale as shown by core holes. The correlation of water-bearing zone 6 between sections A and B has been changed slightly from an earlier published version (Johnston, 1962, fig. 110.2).

A water-bearing zone may consist of a single open bedding joint (for example zone 4, section C, fig. 8) or it may consist of an interval of rock measuring up to one foot in thickness containing several open bedding joints (zone 7, section A, fig. 8). Where the water-bearing zone consists of several joints, the open joint transmitting most of the water at one locality may "pinch out" laterally and be replaced by another open joint within the same zone elsewhere. For example, at section B (fig. 8) most seepage from water-bearing zone 6 came from a joint at the top of a thin-bedded interval; however, at section A all seepage came from a joint at the bottom of the interval. The opening along one bedding joint thus becomes closed while a parallel opening along an adjacent bedding joint becomes open.

The water-bearing zones occur most commonly within intervals of the Lockport containing thin beds from 1/4 to about 4 inches thick which are directly overlain by thick or massive beds. The thin beds generally contain open vertical joints, and at the intersection of such vertical joints with open bedding joints ground-water seepage is greatest. At a few such points water was observed to squirt from the openings into the conduit excavations in much the same manner as it would from a broken water pipe. It seems likely that open joints occur most commonly in thin-bedded intervals because the greater structural rigidity of the overlying thick or massive beds permits the joints to remain open.

Water-bearing zones occur less commonly within thick-bedded intervals. In such cases all seepage occurs from one distinct bedding joint rather than from several joints. Seepage from zone 4 at section C (fig. 8) came from one prominent bedding joint within an interval of beds averaging one foot in thickness. This bedding joint is open about 1/16 to 1/8 inch locally and appears to transmit as much ground water as any water-bearing zone in the Lockport.

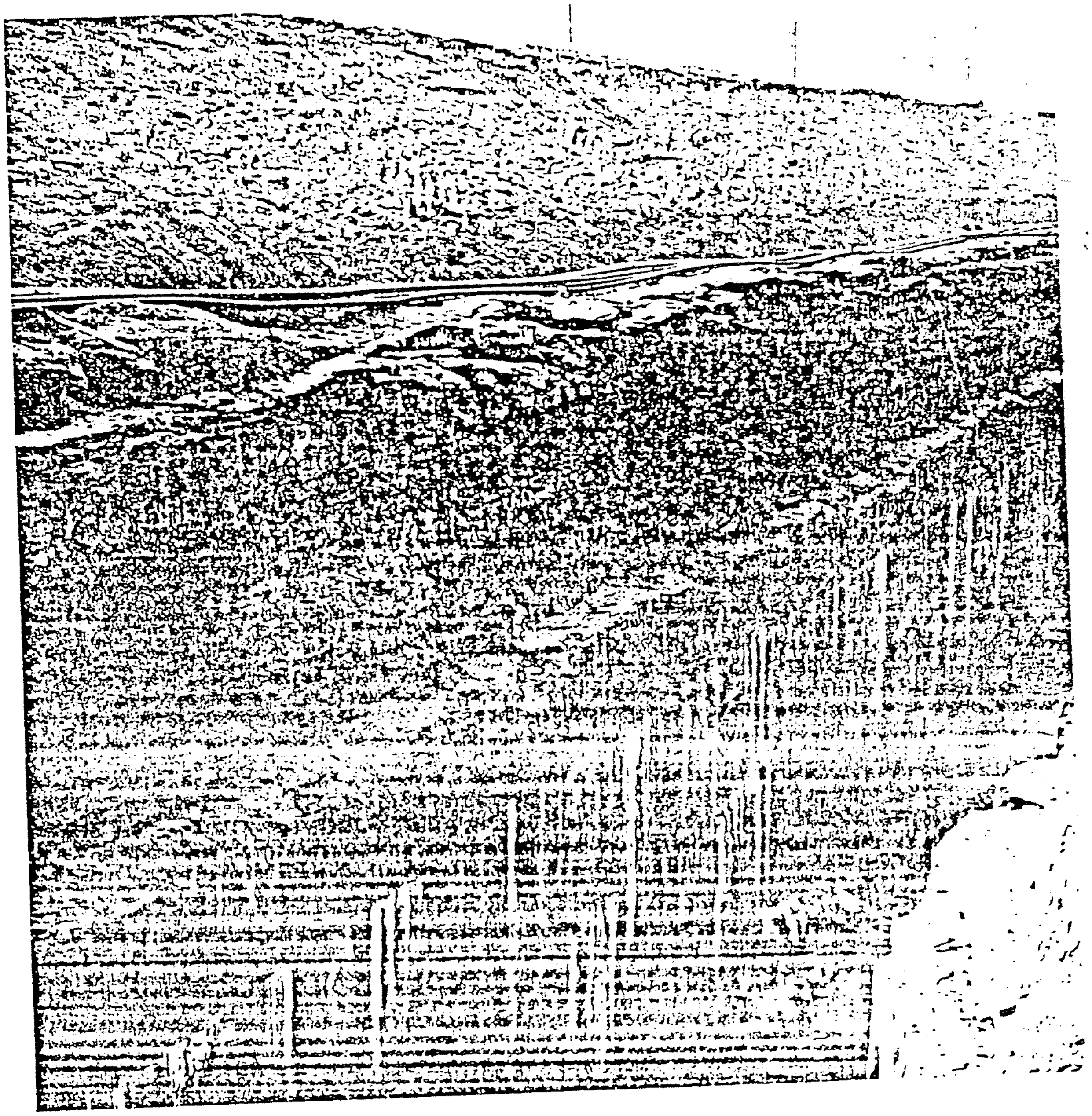

Figure 7.--Seepage from bedding joints in the Lockport Dolomite. View is of east wall of conduit number 1, looking south from Porter Rd. bridge. (Photograph by the Power Authority of the State of New York.)

Vertical joints, excluding those mentioned above which are associated with open bedding joints in thin-bedded intervals, are not important water-bearing openings in the Lockport, except within the top few feet of rock. Two prominent sets of vertical joints exist in the Niagara Falls area; one set oriented N. 65° E. and the other N. 30° W. These joints are fractures in the rock which must be widened by solution before they can become effective water-bearing openings. Such widening is apparent in outcrops of the Lockport. For example, open vertical joints are particularly prominent in the rock cliffs of the Niagara River Gorge and the Niagara escarpment. The width of these joints in many areas exceeds several inches. However, in fresh exposures of the Lockport, such as the conduit excavations, vertical joints are tight and often not apparent to the eye except in the upper few feet of the rock.

Cavities formed by solution of gypsum occur in the Lockport Dolomite. These cavities range in size from 1/16 inch or less to 5 inches but are generally less than one inch in size. The cavities are formed by the dissolving of gypsum by percolating ground water, and there is a complete range in the development of cavities from voids containing no gypsum to pin-point openings in gypsum nodules. The cavities are most abundant in the top 10 to 15 feet of rock but they also occur along water-bearing zones in the lower part of the rock (for example, water-bearing zone 3, section C, fig. 8). In the upper part of the rock, the abundance of cavities locally gives a vuggy appearance to the dolomite.

The cavities in the Lockport resulting from solution of gypsum increase the ability of the Lockport to store water (porosity) but probably have little effect on the water-transmitting ability of the formation. This is because the water-transmitting ability (or permeability) is dependent upon the size of the continuous openings rather than the size of isolated openings. Thus, the relatively thin but continuous bedding joints determine the permeability of the Lockport rather than the larger but isolated cavities resulting from solution of gypsum.

The character and interrelationships of the three types of water-bearing openings described above result in two distinct sets of ground-water conditions in the Lockport Dolomite: (1) a moderately permeable zone at the top of rock, generally 10 to 15 feet thick, characterized by both vertical and bedding joints that have been widened by solution and by gypsum cavities, and (2) the remainder of the formation consisting of seven permeable zones (composed of bedding joints) surrounded by essentially impermeable rock.

<u>Areal extent</u>.--Relatively little is known about the areal extent of the seven water-bearing zones in the Lockport Dolomite, except as observed in the conduits (fig. 8). Many of the individual bedding joints tend to "pinch out" laterally, and be replaced by adjacent joints in the same zone. Such "pinching out" of joints transmitting water was observed in the conduits. Observations in the conduits and data from wells suggest that a few of the zones may persist for tens of miles. The water-bearing zones of greatest areal extent are those which occur at distinct lithologic breaks in the formation. Zone 1, occurring at the base of the Lockport (fig. 8), is frequently reported to be a water-bearing zone by drillers throughout the area. Zone 2, which occurs at the contact between coarse-grained limestone (Gasport Member) and shaly dolomite (DeCew Limestone Member of Williams, 1919) is the source of most of the springs along the Niagara escarpment. Other water-bearing zones, not located at contacts between distinct lithologic units, probably tend to pinch out within a few miles. In summary, at any point in the area, a number of water-bearing zones parallel to bedding exist in the Lockport. All such zones, however, are not necessarily equivalent to the seven water-bearing zones observed in the conduit excavations at Niagara Falls.

It was also noted in the conduit excavations that there were places, even along the most prominent water-bearing zones, where no seepage was occurring. Many such places doubtless represent natural supports for the overlying rock because no extensive horizontal opening below the earth's surface can exist for any great distance. Little is known either about the nature or the size of these support areas or the distance between them. The available data suggest, however, that they encompass an area of at least a few square feet and are separated by a few tens of feet. It may be expected that with depth the size of the supports increases and the distance between them decreases.

The occurrence of ground water principally in zones parallel to bedding is probably characteristic of flat-lying Paleozoic carbonate rocks in many other places. This type of occurrence was reported by Trainer and Salvas (1962, p. 42) in the Beekmantown Dolomite near Massena, N. Y. They observed that "... The openings which are horizontal or gently dipping, and most of which are probably joints or other fractures parallel to the bedding of the rocks, are wider and more numerous than the steeply dipping openings." Although the Beekmantown Dolomite is of an older geologic age than the Lockport, certain similarities exist between the two formations: (1) both units consist of indurated Paleozoic dolomite and limestone; (2) both units are gently dipping, neither having been subjected to extensive folding and faulting which would result in the development of more prominent vertical joints or fractures associated with faulting; (3) both units were subjected to scouring by ice during glaciation within the last 10,000 to 15,000 years and thus, the extensive solution features common to limestones and dolomites in unglaciated areas have not had time to develop. It seems probable that any flat-lying carbonate rock, possessing the characteristics just stated, will contain ground water principally within joints parallel to bedding.

<u>Origin of water-bearing openings</u>.--The origin and the sequence of development of both the vertical joints and bedding joints are of considerable importance in developing an understanding of the occurrence of water in bedrock. Although it was not possible to investigate the origin or the development during this study, speculations based on fundamental principles of geology, especially regarding the origin of the bedding joints, may be worthwhile.

It is widely recognized that joints are formed by forces which tend to pull the rock apart (tension joints) or slide one part of the rock past an adjacent part (shear joints); see, for example, the discussion by Billings (1954, p. 115). The vertical joints were probably formed by a combination of tension and shear forces during or following the folding of the Appalachian Mountains about 200 million years ago. The bedding joints represent tension fractures that formed as a result of expansion of the rock in a vertical direction during more recent geologic time. The Lockport as recently as 200 million years ago was doubtless buried under thousands of feet of other rocks in the Niagara Falls area just as it is at the present time in the southern part of New York State. During the erosion of the overlying rocks the Lockport expanded vertically. The expansion caused fracturing to occur along bedding planes which are natural planes of weakness in the rock and which are approximately parallel to the land surface. Vertical joints, being at right angles to the land surface were little affected by the removal of the overlying rock.

The bedding joints may have been further expanded by stresses produced in the rock during the recession of the glaciers 10 to 15 thousand years ago. The melting of several thousand feet of ice was doubtless accompanied by an expansion of the rock. This expansion either resulted in an enlargement of existing bedding-plane openings or the formation of new openings along other bedding planes.

In recent geologic times, chemical solution of the rock has widened both the vertical and bedding joints. In the already well-developed openings along bedding joints, slight widening by solution has occurred to depths of 100 feet or more. Enlargement of vertical joints, in contrast, is generally restricted to the upper 10 to 15 feet of rock. Cavities formed by solution of gypsum exist where water moving along joints in the Lockport came into contact with gypsum. Gypsum is much more soluble than dolomite; thus, openings formed by the solution of gypsum are wider than other openings along joints. Water moving down vertical joints has dissolved the gypsum to a depth of about 15 feet leaving irregularly-shaped cavities, and water moving along bedding joints has dissolved gypsum to depths of at least 70 feet.

Water-bearing characteristics

Ground water exists in the Lockport Dolomite under artesian, semi-artesian, and unconfined conditions. Unconfined conditions occur where the water table is the upper surface of the zone of saturation within an aquifer. The water table in an unconfined aquifer moves freely upward as water is added to storage, or downward as water is taken from storage. In contrast, an artesian aquifer contains water which is confined by an overlying impermeable bed and which is under sufficient pressure to rise above the top of the aquifer. The level to which water in an artesian aquifer will rise forms an imaginary surface which is called a piezometric surface. Water levels in artesian aquifers change in response to pressure changes on the aquifer rather than to changes in the amount of water stored in the aquifer.

Both artesian and water-table conditions exist in the Lockport. However, artesian conditions predominate. Figure 9 illustrates the occurrence of both artesian and water-table conditions in the Lockport. The wells shown in the diagram are cased through the clay and silt, but are open holes in the bedrock. A packer is installed in each well which tapped water at two or more distinct levels. The packers make possible the measurement of two distinct water levels in each well; a water level above the packer reflecting conditions in the upper part of the rock and a water level below the packer reflecting conditions in the lower part of the rock.

In the upper part of the rock, either artesian or water-table conditions may exist locally. The clay and silt overlying the Lockport are less permeable than the rock and thus act as a confining bed. Artesian conditions exist where the water in the Lockport has sufficient head to rise above the bottom of the overlying clay and silt. In contrast, unconfined (or water-table) conditions exist where the water level occurs within the fractured upper part of the rock, as at well 309-901-5 in figure 9. Locally a "washed till" or dirty gravel zone occurs just above the top of rock. In these localities good connection probably exists between the bedrock and the overlying till or gravel, and the upper part of the rock and washed till zone together form a continuous semi-confined aquifer.

In the lower part of the rock, artesian conditions occur exclusively. The seven water-bearing zones in the Lockport are surrounded by essentially impermeable rock and therefore act as separate and distinct artesian aquifers. The hydraulic nature of the water-bearing zones was observed during the drilling of observation wells in the vicinity of the Niagara Power Project. These wells, whose locations are shown in plate 1, were drilled to observe the effects of the reservoir on ground-water levels in the area. The piezometric level for each successively lower water-bearing zone is lower than for the zone just above it in most of the wells. The reasons for this will be discussed in the section entitled "Ground-Water Movement and Discharge." During construction, the water level in the wells progressively declined in a steplike sequence as the wells were drilled deeper--that is, when a well had been drilled through the uppermost water-bearing zone, the water level in the well remained approximately at a constant level until the next lower zone was penetrated, at which time the water level abruptly declined to the piezometric level of the next lower zone. The difference between the piezometric levels of any two water-bearing zones is large, and in some places is comparable to the distance between zones. If no packer is installed in a well tapping two water-bearing zones, the upper zone will continue to drain into the well indefinitely. This condition exists in a few of the power project observation wells. In these wells the sides of the well remain wet from the level of the upper zone down to the water level in the well. The nature of the water-bearing zones as described above substantiates the reports by drillers and others of "finding water and losing it" in a well, or of wells with "water running in the top and out the bottom." These phenomena occur in some wells tapping two or more water-bearing zones in the Lockport Dolomite.

A well drilled into the Lockport may penetrate several water-bearing zones, but only one of the zones may be hydraulically effective at the site of the well. This is the case for wells 309-901-1, 3, and 5 shown in figure 9. These wells are open below the packers to zones 1, 2, and 3. However, because the water levels observed below the packers in these three wells apparently represents the piezometric surface of zone 3, zones 1 and 2 are not believed to contain effective openings at the sites of the wells. A well also may be drilled through the section occupied by several zones and not be open to any of them. For example, well 309-901-7 shown in figure 9, is apparently open only to the weathered zone at the top of rock.

Yield and specific capacity of wells

The yield of a well in the Lockport Dolomite depends mainly upon which water-bearing zone or zones are penetrated and the degree to which the bedding joints comprising the zones are open to the well. Near the top of rock, the number of open vertical joints and gypsum cavities penetrated may also be important. The average yield of 56 wells tapping the upper and middle parts of the Lockport (which includes water-bearing zones 4 through 7) is 31 gpm (gallons per minute). In contrast, 15 wells penetrating only the lower 40 feet of the Lockport (which includes water-bearing zones 1, 2, and 3) have an average yield of 7 gpm. The yields of individual wells range from less than 1 gpm to 110 gpm. (These figures do not include a few exceptionally high yield wells which obtain water by induced infiltration from the Niagara River and which are discussed in a following paragraph.) Wells tapping the same water-bearing zone may have different yields. For example, wells 309-901-3 and 309-901-5, which are 500 feet apart and tap water-bearing zones 1 through 4 (fig. 9) yielded 7 gpm and 39 gpm, respectively, before the packers were installed. The bedding joints comprising the water-bearing zones are thus more open at well -5 than at well -3.

Increases in yield during drilling in the Lockport Dolomite occur abruptly rather than gradually. As drilling proceeds through the rock, relatively little increase in the yield of a well will be observed until a water-bearing zone is tapped. At that time a marked increase in yield usually occurs. For example, during the drilling of well 308-901-7, the bailing rate abruptly increased from 12 to 50 gpm when water-bearing zone 5 was tapped. During the drilling of well 308-900-21, three distinct increases in yield were observed. The yield, which was 3 gpm at 17 feet (water-bearing zone 7), increased to 9 gpm at 22 feet (an open vertical? joint or solution cavity?) and abruptly increased to 30 gpm at 34 feet (water-bearing zone 6).

Wells in an area about a half mile wide adjacent to the Niagara River above the falls have substantially higher yields than wells elsewhere in the area. The higher yields in this area are caused by two conditions: (1) the Lockport Dolomite is thickest in the area, and (2) more importantly, conditions are favorable for the infiltration of water from the Niagara River. The greater thickness of the Lockport provides the maximum number of water-bearing zones to supply water to the wells. The Niagara River provides an unlimited source of recharge to the water-bearing zones.

Evidence that a substantial part of the water pumped is supplied by induced infiltration from the Niagara River is indicated by the high yields, which exceed 2,000 gpm at some wells, and the chemical character of the water. The chemical composition of the water in well 304-901-6 (which has been pumped at 2,100 gpm) is more similar to Niagara River water than "typical" ground water in the Lockport. (See the following discussion of the chemical character of water and figure 11.) Similar infiltration of Niagara River water into the bedrock at Tonawanda, N. Y., a few miles south of Niagara Falls, was described by Reck and Simmons (1952, p. 19-20).

Infiltration from the river can occur where pumping has lowered ground-water levels below river level to such an extent that a hydraulic gradient is created between the river and the wells. The amount of the infiltration depends on the gradient and the nature of the hydraulic connection between the river and Lockport. The hydraulic connection is controlled by the character of the river bottom. Throughout most of its length in the Niagara Falls area the bottom of the river is covered by a layer of unconsolidated deposits including both till and clay and silt. This layer was found to be from 10 to 20 feet thick in the vicinity of the Niagara Falls water-system intake. (See logs 304-900-i and -j in figure 19.) In the section of the river occupied by rapids, extending a half mile or more above the falls, the bottom has been scoured clean by the river. Where the layer of unconsolidated deposits is present its low permeability greatly retards infiltration. Where the layer is thin or absent infiltration can readily occur.

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One of the most striking features in plate 2 is that all wells yielding more than 1,000 gpm are located in a narrow band that intercepts the river about two miles east of the falls. This band trends in a northeasterly direction roughly parallel to one of the two major directions of vertical jointing. Thus, the very high yields may be caused by a greater abundance of vertical joints within the band of high-yielding wells. Vertical joints provide avenues through which water could readily move from the river downward to the bedding joints comprising the water-bearing zones in the Lockport Dolomite.

Wells in the Lockport Dolomite are almost always adequate for domestic needs of a few gallons per minute. Supplies of 50 to 100 gpm, which are adequate for commercial uses and small public supplies, can be obtained in much of the area underlain by the upper part of the Lockport (pl. 2). Large supplies (over 1,000 gpm), as previously noted, are available only in a small area adjacent to the Niagara River.

Wells inadequate for domestic needs are occasionally reported. All wells that are perennially inadequate are located near the Niagara escarpment and therefore tap only the lowest and least permeable water-bearing zones (1, 2, and 3) in the Lockport. Throughout the area a few shallow wells that derive nearly all their water from a single water-bearing zone become inadequate during the summer and autumn of some dry years. Such is the case with well 308-853-1. This well is 27 feet deep and reportedly obtained over 50 gpm from a water-bearing zone 17 feet below land surface. During the drought in 1960, this zone was dewatered as the water table declined in the fall of the year, and the yield of the well quickly declined to less than 1 gpm. The inadequacy of some wells in the Lockport Dolomite can normally be overcome by deepening the well until it penetrates one or more lower water-bearing zones.

Information on the specific capacity of a well is more meaningful than a simple statement of yield. The specific capacity is the yield per unit drawdown, generally expressed as gallons per minute per foot of drawdown. For example, well 307-903-1 was pumped at 20 gpm with 54 feet of drawdown which indicates a specific capacity of 0.37 gpm per foot. The yield and the drawdown for a number of wells in the Lockport are shown in plates 2 and 3. These data must be used with care as they apply only so long as no part of the formation is dewatered.

As water-bearing zones in the Lockport are dewatered, the specific capacity declines. The decline in specific capacity caused by dewatering a water-bearing zone is shown by the data obtained during a pumping test on well 309-859-1. This well was pumped at 2.2 gpm with 5.0 feet of drawdown for 70 minutes--specific capacity of 0.44 gpm per foot. After 70 minutes, water-bearing zone 3 was partially dewatered and a drawdown of 8.2 feet was required to maintain the pumping rate of 2.2 gpm. This indicates a specific capacity of 0.27 gpm per foot. At the time the well was drilled, it was bailed at 3 gpm with a drawdown of about 60 feet. Thus, during the bailing the entire 42 feet of Lockport penetrated by the well was dewatered. The specific capacity of the well with the Lockport dewatered is 0.07 gpm per foot (3 gpm with 42 feet of drawdown) compared to 0.44 gpm per foot with no dewatering.

water from the Queenston are usually found in two areas--(1) in a band about two miles wide immediately north of the Niagara escarpment, and (2) in areas immediately adjacent to streams. Both these areas are believed to be places of ground-water discharge--that is, areas where ground water is moving upward from the Queenston to discharge naturally.

The origin of the salty water in the Queenston is unknown. In commenting on a similar occurrence of salty water in the bedrock in northern St. Lawrence County, N. Y., Trainer and Salvas (1962, p. 103) suggest three causes for the salty water in that area: (1) connate water, (2) the Champlain Sea, and (3) evaporite deposits. They conclude that the Champlain Sea, which covered the area about 10 or 20 thousand years ago, is the most likely source. This source is not applicable to the Niagara area, however, because the Champlain Sea did not extend into the area. Furthermore, it is unlikely that the salty water in the Niagara area is derived from evaporite beds because no such deposits are known to exist in the Queenston. Nor do any salt beds occur in the bedrock formations overlying the Queenston Shale (fig. 5) in the Niagara Falls area. The nearest salt beds occur about 40 miles to the southeast in the Salina Group which overlies the Lockport Dolomite. However, it is very improbable that salty water from the Salina beds has entered the Queenston Shale because (1) the salt beds themselves act as impermeable barriers to water moving downward from the Salina to the Queenston, and (2) it is more likely that salty water from the Salina would be discharged at points between the outcrop areas of the two formations.

Although direct evidence is lacking, the writer believes that the salty water in the Queenston Shale is most likely derived from connate water. The discharge of connate water begins as soon as a deeply buried bed is brought up into the zone of circulating ground water. The Queenston rocks were deposited as a sea-bottom clay about 350 million years ago, and have been deeply buried throughout most of the intervening time. During some thousands of years of Recent geologic time, connate water has been flushed from the upper several hundred feet of the Queenston. However, it is probable that flushing of the deeper part of the formation is continuing at present.

OCCURRENCE OF WATER IN UNCONSOLIDATED DEPOSITS

The unconsolidated deposits in the Niagara Falls area are not important sources of water. These deposits may be classified into two types based on their water-bearing properties: (1) coarse-grained materials of high permeability (sand and gravel), and (2) fine-grained materials of very low permeability (glacial till and lake deposits). The unconsolidated deposits in the Niagara Falls area are predominantly of the fine-grained type. However, the lack of sand and gravel deposits in the Niagara Falls area, other than a few deposits of very limited thickness and extent, has severely limited the development of large ground-water supplies in the area. Most large ground-water supplies in New York State are derived from sand and gravel deposits.

Table 2 shows selected chemical constituents from wells tapping unconsolidated deposits. Water from the different types of unconsolidated deposits is not easy to differentiate on the basis of quality because many wells tap more than one type of deposit. Thus, water samples from such wells are mixtures of water from two or more deposits. In general, water from the unconsolidated deposits is very hard, but not so highly mineralized as water from the bedrock. A complete analysis of water from well 312-859-1, which taps both till and lake deposits, is listed in table 9. This is a calcium bicarbonate water, very hard (568 ppm of total hardness) containing a moderately high chloride content (105 ppm). Water from the unconsolidated deposits generally has a wide range in chloride content. Those wells which yield water with a high chloride content are probably affected either by (1) local pollution, or by (2) upward discharge of saline water from the underlying bedrock.

SAND AND GRAVEL

Sand and gravel is found in small isolated hills and in a narrow "beach ridge" which crosses the area along an east-west line (pl. 3). The sand and gravel deposits are of limited areal extent, generally thin, and occur as topographic highs. The deposits commonly consist of two lithologic types: (1) fine-grained reddish-brown sand, and (2) coarse sand and pebbles with a matrix of fine to medium sand. The origin of both the beach ridge and small hills of sand and gravel is associated with glaciation in the Niagara Falls area. The small hills are kames, i.e. hills of sand and gravel formed originally against an ice front by deposition from sediment-laden melt-water streams. The long, narrow beach ridge is believed to represent a former shore line of glacial Lake Iroquois. This large lake, the predecessor of the present Lake Ontario, existed in the Niagara Falls area near the end of the Ice Age. The sand and gravel composing the beach ridge apparently was produced from pre-existing material by wave action at the shore which winnowed out most of the silt and clay originally contained in the glacial deposit.

Although the sand and gravel deposits in the Niagara Falls area are much more permeable than the other unconsolidated deposits or the bedrock, their occurrence as small topographic highs permits them to drain rapidly. As a result, ground water generally occurs only within a thin zone at the base of the sand and gravel. This is shown in the cross section of the beach ridge in figure 12. It can be seen that the water table is only a few feet above the base of the sand and gravel. Extensive pumping of any of the wells shown would quickly dewater the sand and gravel. In general, wells in the beach ridge and kames will yield only the small amounts of water required for domestic and small-farm needs.

Moderate supplies of ground water can be obtained from a sand and gravel deposit (probably a kame) just east of Lockport, N. Y. (pl. 3). This is the largest sand and gravel deposit in the area, measuring 1 1/2 by 3/4 miles in size. The thickness of the deposit is highly variable because of the hummocky nature of the land surface, but probably averages 60-70 feet. Some notion of the ability of this deposit to yield water is shown by the yield of 165 gpm pumped from a sand pit during excavation. One large-diameter supply well has been constructed in this deposit. This well (311-838-3) was reportedly pumped at a rate of 200 gpm for 24 hours in 1956.

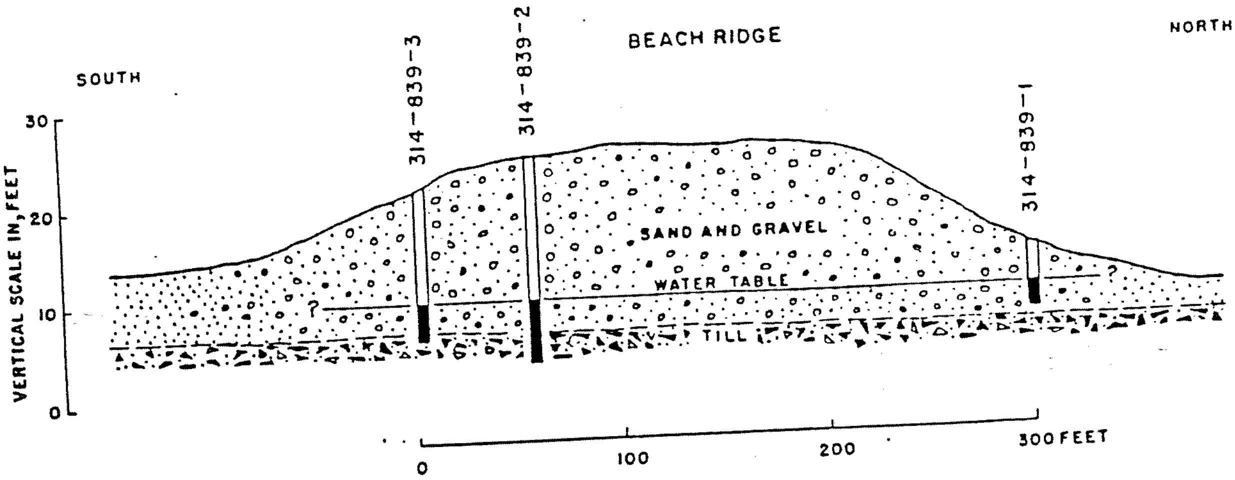

Figure 12.--Cross section of sand and gravel "beach ridge" through wells 314-839-1, -2, and -3.

LAKE DEPOSITS

Lake deposits consisting of silt, clay, and fine sand occur throughout the Niagara Falls area. These deposits are predominantly composed of laminated silt and clay which is characteristically dense and compact. Thin beds of fine sand (locally called quicksand) occur in the lake deposits. The clay, silt, and sand were deposited in lakes which existed in the area at the close of the Pleistocene Epoch (10,000 to 15,000 years ago). The lakes, which formed in the wake of the melting ice sheet, provided large bodies of quiet water for the slow accumulation of fine-grained deposits. Thus, the lake deposits are found at the surface nearly everywhere in the Niagara Falls area. The deposits are thinnest in the area south of the Niagara escarpment where they rarely exceed 20 feet in thickness. On the lake plain north of the escarpment the deposits average 30 to 40 feet in thickness; however, locally they vary from 0 to 90 feet in thickness. The greater thickness on the lake plain results from the persistence of a lake in this area (glacial Lake Iroquois) after the area south of the escarpment was above water.

The silt and clay have extremely low permeability and yield little water to wells. The thin beds of fine sand have comparatively greater permeability. Wells which tap only clay and silt will yield less than 100 gpd; those wells tapping sand beds yield more water and are usually adequate for domestic or very small agricultural needs. The lake deposits are utilized for water supplies only in the lake plain (north of the Niagara escarpment); to the south of the escarpment the deposits are too thin and are underlain by the much more permeable Lockport Dolomite.

The impermeable nature of the silt and clay was shown by a recovery test conducted on well 315-859-1. This well is believed to penetrate only clay and silt. After being pumped dry, the well required 4 1/2 months for

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the water level to rise to its static level 13 feet above the bottom. The permeability of the clay and silt, as calculated from the recovery data, was 0.04 gallons per day per square foot. The well was originally intended to provide water for a domestic supply, but was inadequate. In contrast, well 315-859-2, which is located about 500 feet to the south, provides an adequate domestic supply. This well undoubtedly penetrates a thin bed of sand.

GLACIAL TILL

A thin veneer of glacial till lies between the lake deposits described above and the bedrock throughout nearly all of the Niagara Falls area. The till is a mixture containing mostly sandy silt with boulders, pebbles, and some clay. The till was deposited directly by the ice sheet and is composed of rock which was quarried by the advancing ice, then ground up, and "plastered down" beneath the ice. The till cover in the Niagara Falls area is generally less than 10 feet thick. The greatest thickness of till (30 to 40 feet) is found in the moraines in the eastern part of the area. These features are the low ridges which trend approximately east-west located in the area southeast of Lockport and south of Medina (pl. 3). The moraines are composed of debris which was piled up in front of the advancing ice front. The moraines in the Niagara Falls area are believed to represent four minor readvances of the ice sheet during its retreat from the area (Kindle and Taylor, 1913, p. 10).

The poorly sorted nature of the till causes it to have very low permeability. An indication of the low permeability was obtained from a "slug" test on well 309-900-8. This well penetrates 7.5 feet of lake clay and silt and 1.5 feet of glacial till, and is cased through the lake deposits. The permeability of the till at this well was determined to be 23 gallons per day per square foot. This value for permeability may be too high because the well bottomed at the top of the Lockport Dolomite. Thus an open joint in the rock could have contributed to the yield of the well. However, the value for permeability may be representative of the "washed till-top of rock" aquifer tapped by many dug wells in the Niagara Falls area.

Yields adequate for domestic needs are obtained from till wells which tap: (1) sand lenses within the till, (2) the relatively permeable ("washed") zone at the top of rock, or (3) the sandy till making up the moraines. Wells which do not tap these more permeable horizons in the till are often inadequate to supply even domestic needs. Such inadequate wells yield less than 100 gpd.

separating Lake Erie from Lake Ontario. The winds are thus less moisture-laden than if they had passed over the lakes. Even those winds which may be moisture-laden (from evaporated lake water) may retain most of their moisture until they reach the more hilly areas east of Lake Ontario. The Niagara escarpment appears to have a local effect on the amount of precipitation also. As can be seen from the precipitation data given in table 5, Lewiston (elevation 320 feet), which is located below the escarpment, receives less precipitation than Lockport (elevation 520 feet), which is at the escarpment. Table 5 also shows that precipitation is fairly evenly distributed throughout the year. Within a given year, however, large variations from the average figures listed may occur. Note that the minimum monthly precipitation for each month during the 25-year period is between 1/2 and 1/20 the average precipitation for that month. However, the minimum annual precipitation (1941) is more than 1/2 the average annual precipitation. Average annual temperature is 48°F at Lewiston. The length of the growing season averages 160 days.

GROUND WATER

A part of the rain and snow falling on the Niagara Falls area seeps into the ground and continues downward to the water table to become ground water. The ground water is in constant, but generally very slow, movement from points of recharge to points of discharge. Ultimately all ground water in the area is discharged into Lake Ontario or the Niagara River either directly or via small tributary streams. The Niagara Falls area is, in effect, a peninsula-shaped catchment area in which the ground-water reservoir is being repeatedly replenished by precipitation, and constantly discharging to the surrounding surface-water bodies. This section of the report describes: (1) recharge to the unconsolidated deposits and the bedrock, (2) movement and discharge of ground water in the area, and (3) changes in storage in the ground-water reservoir as shown by water-level fluctuations.

RECHARGE

The source of nearly all the ground-water recharge in the Niagara Falls area is precipitation; however, a small amount of recharge also occurs in the area beneath and immediately adjacent to the Niagara Power Project reservoir by infiltration from the reservoir. Recharge of ground water means simply the addition of water (or quantity added) to the zone of saturation (Meinzer, 1923, p. 46). The rate and amount of recharge depends mainly upon the permeability of the soil, the amount of precipitation, and the soil-moisture condition at the time of precipitation. The rate of infiltration of water into the soil increases with increase of permeability. In the relatively small part of the Niagara Falls area underlain by sand and gravel, infiltration rates are greatest. However, throughout most of the area underlain by glacial till and lake clays and silts infiltration rates are low and surface runoff is high.

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Table 5.--Monthly precipitation at Lewiston and Lockport, N. Y., 1936-60 (Data from reports of U.S. Weather Bureau)

Month	Lewiston (1 mile north of; elevation 320 feet)		Lockport (2 miles northeast of; elevation 520 feet)	
	Average (inches)	Minimum (inches)	Average (inches)	Minimum (inches)
January	1.98	0.59 (1946)	2.38	0.67 (1946)
February	2.35	.54 (1947)	2.52	.85 (1947)
March	2.49	.63 (1958)	2.56	.71 (1958)
April	2.66	.83 (1946)	2.80	.91 (1946)
May	3.08	.71 (1941)	3.26	.94 (1936)
June	2.18	.66 (1953)	2.41	.33 (1953)
July	2.44	1.15 (1955)	2.70	.90 (1954)
August	2.57	.21 (1948)	2.97	.36 (1948)
September	2.97	.46 (1941)	2.92	.14 (1941)
October	2.55	.47 (1947)	2.85	.60 (1938)
November	2.33	.75 (1939)	2.62	.64 (1939)
December	2.02	.39 (1958)	2.39	.71 (1943)
Annual	29.62	17.64 (1941)	32.38	19.75 (1941)

The mechanism of recharge to the Lockport Dolomite is of primary concern in this report because this bedrock unit is by far the most important aquifer in the Niagara Falls area. As discussed previously, most ground water occurs in the Lockport within seven relatively permeable zones parallel to bedding which are separated by essentially impermeable rock. Recharge to these water-bearing zones occurs by one of two mechanisms: (1) downward movement of water through vertical joints or (2) recharge directly to the water-bearing zones at the outcrop of the bedding joints composing the zones.

Several lines of evidence suggest that recharge to the Lockport Dolomite occurs predominantly at the outcrop of the water-bearing zones. The lack of persistent open vertical joints in the Lockport as observed in the conduit excavations, suggests that vertical joints are not important avenues for downward movement of water. However, this is not conclusive evidence in itself because on an areal basis, many vertical joints, although apparently tight, might be able to transmit appreciable quantities of water when considered as a whole even though each joint singly might transmit a very small quantity of water. More conclusive evidence of a negligible movement of water along vertical joints is the occurrence of "dry" open bedding joints below the "wet" bedding joints comprising the water-bearing zones in the Lockport (fig. 8). This phenomenon could not occur if permeable vertical joints connected the "dry" and "wet" bedding joints. It seems probable that the "dry" bedding joints exist because they receive little or no recharge in their outcrop area. This lack of recharge would be particularly applicable to those bedding joints cropping out along the Niagara escarpment where there is very little opportunity for recharge.

The most important indication that recharge to the water-bearing zones of the Lockport Dolomite occurs at the outcrop of the zones, is the alignment of water levels approximately parallel to the dip of the zones themselves. This alignment of water level is shown for water-bearing zone 3 in figure 9.

The wells shown in the cross section are adjacent to the reservoir of the Niagara Power Project; however, the water levels shown were measured prior to flooding of the reservoir. If recharge to the water-bearing zones did occur throughout the area by downward movement through vertical joints, the gradient along the zones would steepen in the downdip direction rather than continue roughly parallel to the dip of the zones--that is, if it is assumed that there is no increase in transmissibility downdip. This steepening of the hydraulic gradient would be required in order to transmit the ever-increasing amounts of water supplied to the zone by the vertical joints. No such steepening of the gradient was observed.

In summary, it appears that recharge occurs principally at the outcrop of the water-bearing zones in the Lockport Dolomite and that water then moves down the dip of the zone with a relatively constant loss of head. Recharge is probably not limited to the actual line of outcrop of a zone, however, but occurs throughout the area where the zone is reached by the enlarged vertical joints that occur in the upper few feet of the rock.

Little is known about the recharge to the other bedrock formations underlying the Niagara Falls area. It is probable that a very small amount of water moves downward from the Lockport Dolomite into the Rochester Shale and the underlying bedrock units. As was pointed out in the preceding discussion, however, vertical openings even in the Lockport Dolomite appear to transmit relatively little water except in the upper few feet of the rock. Therefore, movement of water from the Lockport into the underlying formations probably occurs only along widely spaced major vertical joints. Some of the water in the deeper bedrock units in the Niagara Falls area may also be derived from recharge to these beds in the area to the south. Such water would move through the Niagara area toward the Niagara gorge and Lake Ontario, both of which are regional discharge areas.

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GROUND-WATER MOVEMENT AND DISCHARGE

Ground water moves from points of high head to points of low head (or potential), in other words from points where the water table or piezometric surfaces are highest to points where they are lowest. The direction of ground-water movement in the upper few feet of bedrock and in the unconsolidated deposits (where water-table conditions exist) is shown by the configuration of the water table. The direction of movement in the remainder of the bedrock is shown by the configuration of the piezometric surfaces associated with each of the artesian water-bearing zones in the different bedrock formations.

As discussed previously, each of the seven water-bearing zones in the Lockport is a distinct artesian aquifer with an associated piezometric surface. To show in detail the ground-water movement in the Niagara Falls area, it would be necessary to construct a water-table map, and piezometric maps for each of the water-bearing zones. Such maps are not included in this report because water levels could be measured in relatively few wells and because of the difficulty of differentiating between water levels which represent the water table and water levels which represent the piezometric surfaces associated with each of the several water-bearing zones. In a few wells constructed with packers, such as shown in figure 9, it was possible to measure separate water levels associated with the water table and with distinct water-bearing zones. In wells not equipped with packers, which includes all domestic and industrial wells in the area, a measured water level is an average of the heads of the different water-bearing openings penetrated by the well. Such an average water level represents neither the water table nor the piezometric surface of a single water-bearing zone.

Nearly all water-level data that could be used in determining direction of ground-water movement were obtained from wells in the vicinity of the pumped-storage reservoir. These data show that in general the configuration of the water table follows the surface of the land, being highest under hills and in interstream tracts and lowest in stream valleys. The configuration of the piezometric surfaces associated with each water-bearing zone in the Lockport has little relationship to the land surface. The piezometric surfaces are approximately parallel to the slope of the water-bearing zones. The disparity in the configuration of the water table and the piezometric surfaces is shown in figure 9, which was previously referred to in the discussion of artesian and water-table conditions in the Lockport. As shown in the figure, the water table slopes from all directions toward Fish Creek, whereas the piezometric surface for water-bearing zone 3 slopes to the south away from the creek. Thus, ground-water movement in the upper fractured part of rock and in the overlying unconsolidated deposits is toward the creek, but movement along water-bearing zone 3 and, presumable in the other water-bearing zones, is to the south toward the upper Niagara River.

Figure 14 shows the inferred direction of ground-water movement in the upper water-bearing zones of the Lockport Dolomite. This figure is based on adequate data only in the vicinity of the reservoir. Because only a few scattered water-level observations are available for the area south of the reservoir, the flow lines in that area are based largely on the fundamental principles governing ground-water movement.

It may be observed in figure 14 that ground water in the Lockport Dolomite moves north toward the Niagara escarpment in a narrow area parallel to the escarpment. This northerly direction of ground-water movement is shown by (1) the location of springs near the base of the Lockport along the escarpment (pl. 1), and (2) the decline of water levels in wells in the direction of the escarpment. A divide in the water table and in the upper fractured part of the rock apparently exists at a distance of 1,000 to 2,000 feet south of the escarpment. The existence of this divide is shown by the reversal of hydraulic gradient in the area. The gradient is toward the escarpment in the area less than 1,000 feet south of the escarpment. However, a hydraulic gradient to the southeast (approximately parallel to the dip of the beds in the Lockport) was observed in wells located over 2,500 feet south of the escarpment.

Prior to the start of the investigation it was assumed that water in the Lockport Dolomite in the western part of the Niagara Falls area moved west to the gorge to discharge. It was observed very early in the study, however, that there was practically no evidence of seepage on the sides of the gorge. The lack of seepage could be explained by (1) assuming that the water moving toward the gorge was intercepted by enlarged vertical joints parallel to the gorge, or (2) assuming that there was little or no movement of water toward the gorge.

Because the city of Niagara Falls and the area along the gorge north of the city is supplied by the Niagara Falls municipal water system, very few wells suitable for water-level observations were found in the area. The only wells readily accessible for water-level measurements were in the vicinity of the power station and canal. The data from these wells indicate that water moves toward the gorge. The width of the area supplying water to the gorge, however, could not be determined. Indirect information relative to this problem was derived from the water-level measurements in the vicinity of the reservoir. It was found that if the slope of the piezometric surface for a specific water-bearing zone (for example, zone 3 in figure 9) was extended to the south, the pressure reached the level of the upper Niagara River a short distance south of the reservoir. This does not prove but certainly strongly suggests that under natural (pre-power project) conditions the water in the Lockport Dolomite turned west to discharge into the Niagara River gorge, roughly midway between the escarpment and the upper Niagara River (fig. 14). The absence of seepage on the sides of the gorge, therefore, is believed to be attributable to enlarged vertical joints parallel to the gorge.

Ground-water movement as it probably existed in 1962 may be summarized as follows: (1) water moves northward in a narrow area parallel to the Niagara escarpment, (2) water moves southward (downdip) in the area around the reservoir (which acts as a recharge mound and tends to deflect the water moving from the north), (3) water moves into the canal, conduits, and area of industrial pumping to discharge, and (4) water moves toward the gorge in the southwestern part of the area.

On the lake plain, north of the Niagara escarpment, ground water moves in a generally northward direction toward Lake Ontario. The water table is located within the lake deposits about 3 to 10 feet below the surface. The water table very nearly parallels the land surface and slopes regionally toward Lake Ontario with a gradient of 5 to 20 feet per mile. It also slopes toward the streams crossing the lake plain in a narrow area adjoining each stream. The direction of ground-water movement in the Lockport Dolomite in the eastern part of the Niagara Falls area is not known.

WATER-LEVEL FLUCTUATIONS

Fluctuations of ground-water levels reflect changes in the amount of water stored in an aquifer. A decline in water level shows a decrease in storage in the aquifer, and means simply that discharge from the aquifer is exceeding recharge. A rise in water level indicates the reverse situation--recharge is greater than discharge. In wells tapping unconfined aquifers, water-level fluctuations show changes in the position of the water table. In wells tapping artesian aquifers, water-level fluctuations show changes in artesian pressure.

Natural fluctuations

Water-level fluctuations of natural origin can be broadly classified as either short- or long-term fluctuations. The short-term fluctuations are produced mainly by changes in atmospheric pressure, ocean tides, and earth tides. Fluctuations due to atmospheric pressure and earth tides occur in the Niagara Falls area but are of relatively little importance in the description of the ground water. Such short-term fluctuations are observed only in wells tapping artesian aquifers. Long-term fluctuations are largely a product of climate, particularly precipitation and temperature. The long-term fluctuations in water levels show changes in the natural rate of recharge to an aquifer compared to its rate of discharge to springs and stream beds.

The most noticeable fluctuation of ground-water levels in the Niagara Falls area are seasonal fluctuations. In general, water levels in the area reach their peak during the spring of the year (March and April) because of the large amount of recharge provided by snow melt and precipitation. Water levels generally decline throughout the summer because most of the precipitation is lost by evaporation and the transpiration of plants. Such water loss is characteristic of the summer growing season. During other seasons substantial amounts of water pass through the soil zone and continue downward to the water table. Water levels generally reach their yearly lows near the end of the growing season during September or October. Thereafter, water levels begin to rise and this rise is more or less continuous through March or April. Because the amount of precipitation is normally evenly spaced throughout the year in the Niagara Falls area (table 4), seasonal fluctuations are more a product of air temperature than of precipitation. The air temperature controls whether precipitation falls as snow or rain, whether the ground is frozen at the time of precipitation, and the length of the growing season; all of these are factors that affect water levels.

SPRINGS

Springs are not widely utilized as ground-water supplies in the Niagara Falls area. Springs are common along the Niagara escarpment but rarely occur elsewhere in the area. (See plates 1 and 3.)

Most of the springs along the escarpment originate near the base of the Lockport Dolomite. The source is nearly always seepage from bedding joints at the contact between the DeCew Limestone Member of Williams (1919) and the Gasport Limestone Member of the Lockport (water-bearing zone 2 in fig. 8). The springs occur where vertical joints intersect the water-bearing zone. Enlargement of both vertical and bedding joints is common at the springs, and in some cases has proceeded to the point where small caves have developed.

Springs are uncommon along the cliffs of the Niagara River Gorge. This lack of springs probably results from the development of extensive open vertical joints parallel to the face of the gorge. These joints drain water readily from the Lockport Dolomite through the underlying rocks and talus to the river. (See figure 6.)

Notable exceptions to the lack of springs along the gorge are springs 309-902-2Sp and -3Sp which are located just south of the Niagara escarpment (pl. 1). These springs are located in caves developed by solution of the shaly dolomite of the DeCew Member of Williams (1919) of the Lockport. The source of the springs, like the source of most springs along the escarpment, are bedding joints at the contact between the DeCew and Gasport Members (water-bearing zone 2 in fig. 8). Extensive solution features, such as sink holes, exist in the area drained by these two springs. Fish Creek, which crosses the area, loses water as it flows across the bedrock, and apparently contributes a major part of the water discharging from the springs. Dye introduced into Fish Creek reappeared at the springs, 1,000 feet away, 38 minutes after introduction (personal communication from C. P. Benziger of Uhl, Hall & Rich). The yield of these springs is therefore highly variable; the yields varying from about 15 gpm during dry periods to reportedly thousands of gallons per minute following heavy rains or periods of melting snow. The water from springs 309-902-2Sp and -3Sp is polluted by nearby septic tanks as shown by the strong odor of sewage and the sudsy character of the water.

The yield of single springs in the Niagara Falls area ranges from about 2 to 30 gpm during the dry parts of the year. The yields of most springs increase following rains but not nearly so much as the increase noted for springs 309-902-2Sp and -3Sp in the discussion above. Spring 310-859-6Sp is the only spring in the area utilized as a water supply on a year-round basis. This spring provides an adequate domestic supply for a trailer court with eight families.

PRESENT UTILIZATION

An estimated 10 mgd (million gallons per day) of ground water was obtained from wells in the Niagara Falls area during 1961-62. This figure contrasts with an estimated 60 mgd of water obtained from surface sources

REFERENCE NO. 3

DRAFT // PROFILE REPORT

REVISION #1
DATE

NAME:

64th STREET - SOUTH* (DEC #932085)

*NOTE: THIS IS THE SECOND OF TWO SITES LISTED COLLECTIVELY AS "64th STREET" IN HAZARDOUS WASTE DISPOSAL SITES IN NEW YORK STATE, Volume 3.

LOCATION:

THIS IS AN APPROXIMATELY 10 ACRE LANDFILL LOCATED 250 FEET SOUTH OF NIAGARA FALLS BOULAVARD IN NIAGARA FALLS. MOST OR ALL OF THE AREA BETWEEN 61ST STREET AND Chevy PLACE NORTH OF GIRARD AVENUE IS INCLUDED.

A SITE SKETCH IS INCLUDED

OWNERSHIP:

RUSSO CHEVROLET INC. OWNS MOST OF THE PROPERTY NORTH OF JOHN AVE. (BASED ON AIR PHOTOS,) SEVERAL COMMERCIAL PROPERTIES LOCATED ALONG NIAGARA FALLS BOULAVARD ARE NOT BELIEVED TO HAVE BEEN LANDFILLED. SOUTH OF John ~~[illegible]~~ AVENUE, MOST OF THE LAND IS OWNED BY SAM A RUSSO. A RESIDENTIAL AREA ALONG 61ST STREET FROM John AVENUE TO GIRARD AVENUE MAY ALSO HAVE BEEN LANDFILLED. PRESENTLY FOUR DOUBLE townhouses EXIST IN THIS AREA.

A SKETCH OF PRESENT DAY PROPERTY LINES AND OWNERS ARE ~~IS~~ INCLUDED.

NERSHIP TE OF NDFILLING

DRAFT

HISTORY:

INSERT THIS SITE IS believed TO have been farmland prior to 1950. THE CITY OF NIAGARA FALLS, reportedly USED THE SWALE AREA AS A MUNICIPAL LANDFILL IN THE 1950'S AND POSSIBLY THE EARly 1960'S.

AT THAT TIME A SWALE CUT DIAGONALLY FROM 60th STREET AND NIAGARA Falls BLVD TO GIRARD AVE AND 62nd STREET.

INDUSTRIAL WASTES ARE POSSIBLE ALTHOUGH THERE IS NO DOCUMENTED REPORT OF INDUSTRIAL DISPOSAL HERE. TO DATE, THE LANDFILL HAS NOT BEEN PROPERLY CLOSED.

RECENT INSPECTIONS FOUND THE AREA TO BE ROUGH GRADED, WITH SOME DEPRESSIONS AND MOUNDING. A SPARCE COVER OF TALL GRASS COVERS THE SITE. MOST OF THE AREA IS VACANT FIELDS. ASH AND SLAG-LIKE MATERIAL IS VISIBLE IN SEVERAL AREAS.

RESULTS OF PREVIOUS SAMPLING:

IN 1982, THE U.S. GEOLOGICAL SURVEY SAMPLED 5 LOCATIONS AROUND THE PERIMETER OF THE SITE.

INSERT IN 1985 AN EPA INVESTIGATION ~~BY~~ NUS CORPORATION PROVIDED SOIL AND SUB SURFACE SAMPLES AT ELEVEN DIFFERENT LOCATIONS THROUGHOUT THE SITE.

PRESENTLY, THE EPA HAS CONTRACTED NUS CORP. TO TAKE SAMPLES AT FOUR PERIMETER LOCATIONS.

THE N.Y.S. HEALTH DEPARTMENT HAS VISITED THE SITE IN JUNE 1985

(NEXT PAGE)

RESULTS AND LOCATIONS OF SAMPLING ARE included.

NO PHASE I STUDY HAS been MADE YET BUT ONE IS SCEDULED SOON.

EXAMINATION OF AERIAL PHOTOGRAPHY:

AN EARLY 1939 PHOTO SHOWS THE AREA TO BE FARMLAND WITH NO EVIDENCE OF LANDFILLING, USDA AERIAL PHOTOGRAPH ARE-3V-82 (1951) SHOWS THE SWALE BEING FILLED IN IMMEDIATELY SOUTH OF NIAGARA FALLS BLVD. A 1958 PHOTO (ARE-3V-84) SHOWS THE ENTIRE LENGTH OF THE SWALE FILLED IN. ADDITIONAL ~~AND APPEARS~~ SUSPECTED FILL AREAS OCCUR NORTH OF THE SWALE IN THE AREA BETWEEN WHAT IS NOW 61ST STREET AND CHEVY PLACE. A 1966 PHOTO (ARE-2GG-27) INDICATED THAT THE AREA APPEARED TO BE LEVELED AND GRASSED. THE AUTO DEALERSHIP AND FOUR HOMES ON

DRAFT

61ST STREET WERE NOT YET BUILT. THE MOTELS ALONG NIAGARA FALLS BOULAVARD WERE IN PLACE IN THE 1958 PHOTO.

SOILS/GEOLOGY:

A CURRENT SOIL SURVEY FOR THIS AREA IS UNAVAILABLE. THE 1947 SOIL SURVEY FOR NIAGARA COUNTY LISTED THE SOILS AS TONAWANDA SILT-CLAY LOAM. THESE SOILS ARE REPORTED TO POOL WATER AND REQUIRE ARTIFICIAL DRAINAGE. THE EFFECT OF LANDFILLING ON SOIL PROPERTIES IS UNKNOWN.

~~PRESENT DRILLING BY~~ NUS ~~AT THE~~ CORNER OF ~~CHEVY PLACE AND NIAGARA FALLS~~ BOULAVARD HAS CONFIRMED ~~HAS~~ ~~THAT~~ LOCKART DOLO BEDROCK HAS BEEN REPORTED AS BEING ~~LOCATE AT~~ A DEPTH OF 21 FEET, ~~immediately northeast of the site~~ at the INTERSECTION OF CHEVY PLACE AND NIAGARA FALLS BOULAVARD

GROUNDWATER

PRELIMINARY ~~GROUNDWATER INFORMATION~~ HAS BEEN GATHERED FROM the ~~INFORMATION GATHERED FROM PRESENT NUS DRILLING AT~~ CHEVY PLACE - NIAGARA FALLS BOULAVARD INTERSECTION. AN APPARENT PERCHED WATER TABLE EXISTS AT A DEPTH OF 5 FEET. THIS WATER TABLE PROBABLY VARIES GREATLY UPON SEASONAL CONDITION ~~CHANGES~~. ALSO, AN ARTESIAN WELL EXISTS IN THE REGOLITH ZONE WHICH FILLS TO A DEPTH OF 6 FEET FROM THE SURFACE.

TENATIVELY, IT IS SPECULATED THAT GROUNDWATER in bedrock FLOWS TO THE SOUTH-SOUTHWEST AT THIS SITE. THE CONDITION AT THE HIGHER PERCHED WATER TABLE ARE NOT KNOWN. RESULTS OF THE ON-GOING EPA INVESTIGATION SHOULD CONFIRM GROUNDWATER FLOW DIRECTION

THERE ARE NO KNOWN DRINKING WATER WELLS IN THIS AREA. THE NEAREST INDUSTRIAL WELL IS ABOUT TWO miles southwest OF THE SITE. This well is used only FOR non-contact cooling water and is unlikely to be affected by this site.

DRAFT

SURFACE WATER:

A 1935 USGS TOPOGRAPHY MAP INDICATED THAT THIS AREA DRAINED TO THE NORTH. ~~AT THAT TIME~~ THAT A SWALE THROUGH THE ~~UNION CARBIDE~~ CENTER OF THE SITE SUPPORTED A FULL TIME STREAM FLOWING NORTH THROUGH THE UNION CARBIDE (NOW NEWCO) PROPERTY which EVENTUALLY ENTERED CAYUGA CREEK. SINCE THE TIME THE 60th STREET SEWER WAS INSTALLED, ALL RUNOFF FROM THIS SITE HAS ENTERED THE NIAGARA RIVER VIA THE 60th STREET SEWER. THE only REMAINING SECTION OF THIS SWALE IS ON GREAT LAKES CARBON PROPERTY. THE FLOW IS NOW south to AN UNDERGROUND CULVERT BENEATH NIAGARA FALLS BOULAVARD.

THE NIAGARA RIVER IS ONE mile south OF THE SITE. If CONTAMINANTS FROM THIS SITE LEAVE THROUGH RUNOFF, THEY will ENTER THE RIVER AT THE 60th STREET OUTFALL, UPSTREAM OF THE CITY WATER INTAKES. IT IS FELT AT THIS TIME THAT ANY CONTAMINANTS ENTERING THE NIAGARA RIVER ARE INSIGNIFICANT TO THE CITY'S WATER QUALITY BECAUSE THE LOCATION OF THE WATER INTAKES ARE NEAR NAVY ISLAND.

THERE ARE NO WETLANDS WITHIN ONE MILE OF THIS SITE. THE SITE IS NOT LOCATED WITHIN A 100 YEAR FLOOD PLAIN.

AIR:

There have been no reported air QUALITY PROBLEMS. ~~NO PROBLEMS ARE EXPECTED.~~

REPORTS FROM NUS CORP. AIR MONITORING WITH OVA AND HNu EQUIPMENT AT THE TIME OF WELL DRILLING AND SAMPLING, INDICATED THAT NO READINGS OVER BACKGROUND LEVELS WERE ENCOUNTERED. NO AIR QUALITY PROBLEMS ARE EXPECTED.

DRAFT

RESULTS OF PREVIOUS SAMPLING (INSERT)

IN JUNE 1985, AN EPA INVESTIGATION BY NUS CORPORATION PROVIDED SOIL AND SUBSURFACE SAMPLES AT ELEVEN DIFFERENT LOCATION THROUGHOUT THE SITE. DURING NOVEMBER 1985 ~~RECENTLY~~, THE EPA ~~HAS~~ CONTRACTED NUS CORPORATION TO INSTALL NESTED WELL CLUSTERS AND TAKE SAMPLES AT FOUR PERIMETER LOCATIONS.

~~NO PHASE I STUDY HAS BEEN MADE TO DATE, BUT ONE IS SCHEDULED SOON.~~

RESULTS AND LOCATIONS OF THE USGS AND EPA SAMPLINGS ARE INCLUDED. THE ANALYTICAL RESULTS OF THE JUNE 1985 EPA INVES REVEALED A VARIETY OF POLYAROMATIC HYDROCARBONS AND PHTHALATES THAT A(RE) PRESENT THROUGHOUT THE ~~FORMED~~ FORMER DISPOSAL AREA. CONCENTRATIONS OF PAH'S RANGED FROM TRACE QUANTITIES TO 61,000 ug/kg. IN GENERAL, HIGH CONCENTRATIONS OF ORGANIC COMPOUNDS WERE FOUND AT THE SURFACE THAN IN LOWER STRATA. FOUR PESTICIDES WERE DETECTED AT CONCENTRATIONS OF TRACE QUANTITIES TO 330 ug/kg AND WERE ALSO HIGHEST AT THE SURFACE. IN ADDITION, HIGH LEVELS OF MERCURY AND ZINC WERE FOUND AT VARIOUS DEPTHS AND LOCATIONS THROUGHOUT THE FORMER DISPOSAL AREA.

DRAFT

DIRECT CONTACT:

THERE ARE PRESENTLY SIGNS OF EXPOSED WASTE (ASH AND SLAG). ACESS TO THE SITE IS UNRESTRICTED.

THE NEAREST POPULATION IS ATOP OR ADAJACENT TO THE Filled AREAS. RESIDENTIAL PROPERTIES ARE WITHIN 200 FEET ALONG THE WEST SIDE (61ST STREET). COMMERCIAL AREAS ARE ADJACENT TO THE NORTH. RUSSO CHEVROLET LIES ON TOP OF THE FILLED AREA. INDUSTRIAL PROPERTY IS 500 FEET NORTH (GREAT LAKES CARBON). THERE IS NO AGRICULTURAL LAND WITHIN TWO MILES.

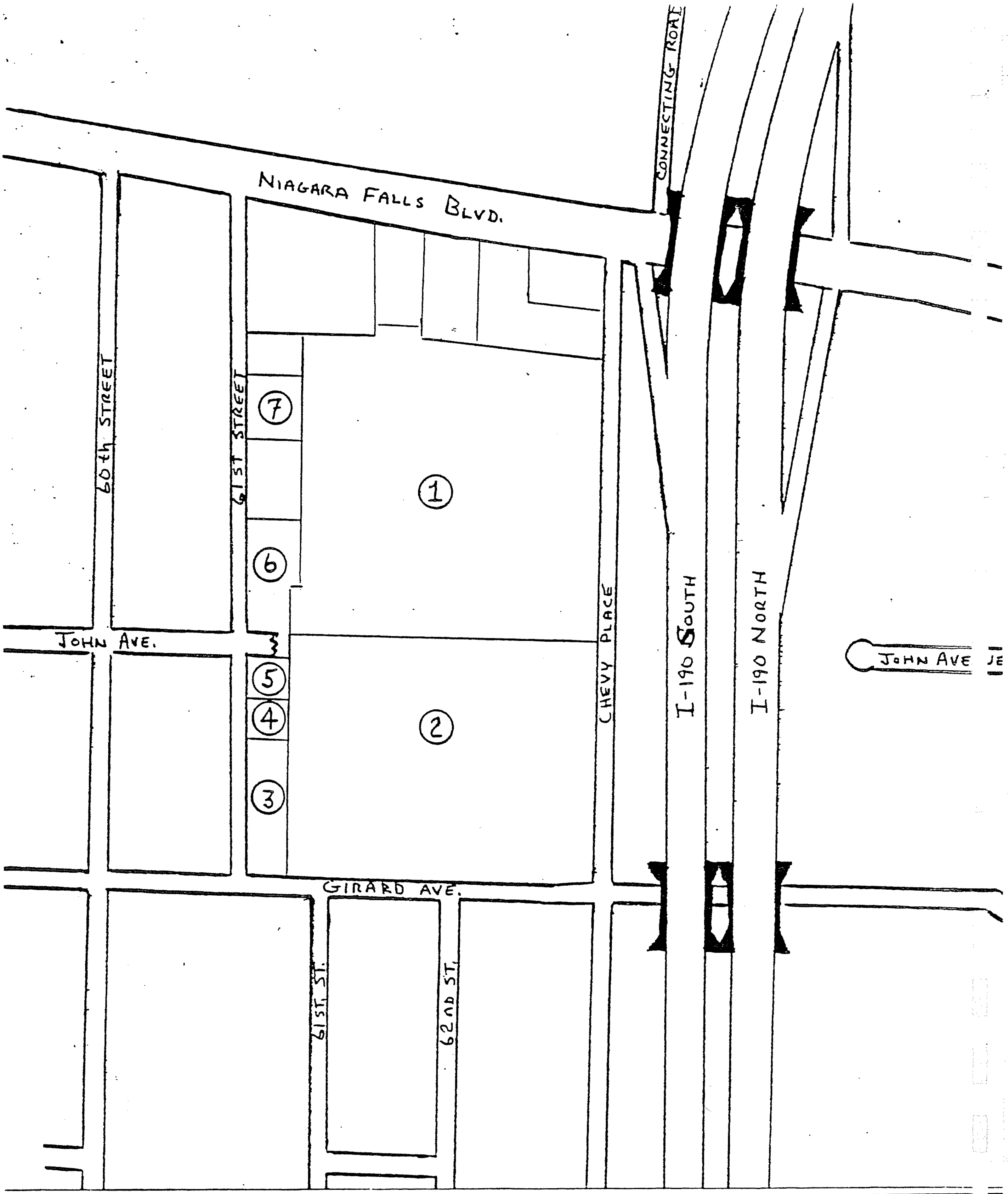
THE NEW YORK STATE DEPARTMENT OF HEALTH HAS VISITED THE SITE IN JUNE 1985. THEY RECOMMEND THAT THE SITE NOT BE FENCED IN. THEY ALSO ADVISED THAT CHILDREN UNDER THE AGE OF 3 NOT BE ALLOWED TO PLAY IN THE LANDFILLED AREA.

Conclusion

PROPERTY OWNERS OF 64 STREET SOUTH AREA:

SECTION	OWNER
1	RUSSO CHEVROLET INC.
2	SAM A. RUSSO
3	ROSE ANN E. SPALLING
4	WALLACE W. AND BETTY L. BLAKE
5	H. J. MYE LUMBER CORPORATION
6, 7	OLDSWAY AUTO LEASING INC.

SEE SITE SKETCH FOR SECTION LOCATION



NIAGARA COUNTY HEALTH DEPARTMENT

SITE NAME: 64th St. - South (OWNERS) 5-108	DEC # 932085
DRAWING NOT TO SCALE | DATE: 12/10/85	BY: PAUL DICKY

WELL IDENIFICATION

● INDICATES THE BORING/SAMPLING PROGRAM CONDUCTED BY THE NUS CORPORATION ON JUNE 11, 1985 FOR THE EPA.

LOCATIONS 1 THROUGH 7 WERE SELECTED FOR SAMPLING AT THE SURFACE AND AT DEPTHS TWO AND FIVE FEET BELOW THE SURFACE.

LOCATIONS 8 THROUGH 11 ARE SURFACE SOIL SAMPLES

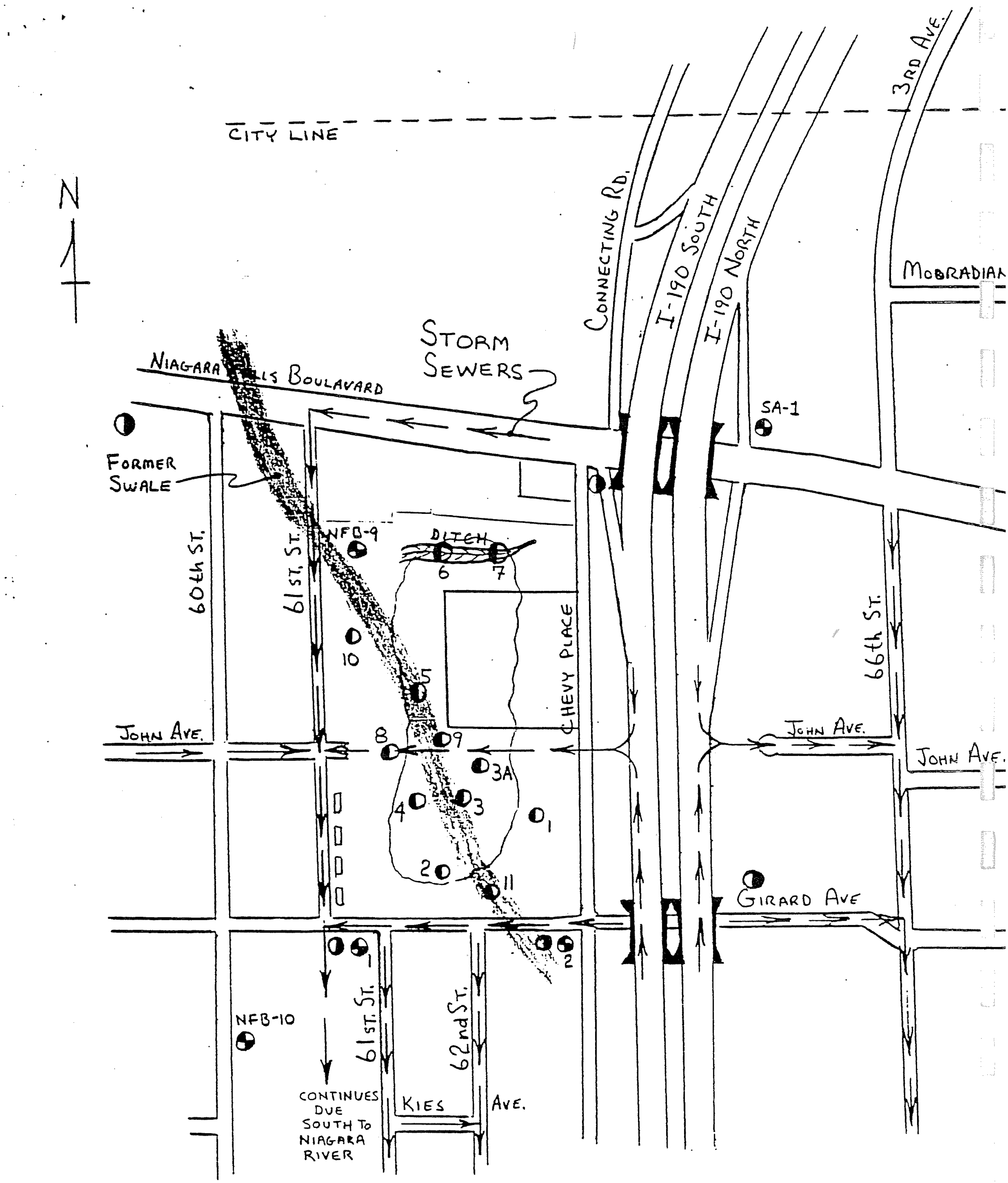
● INDICATES THE BORING/SAMPLING PROGRAM CONDUCTED BY THE US GEOLOGICAL SURVEY IN 1982.

SA-1 IS A HYDROGEOLOGIC TEST BORING AND MONITERING WELL

NFB-9, 10 ARE NIAGARA FALLS BEDROCK MONITORING WELLS

ALSO SAMPLES FROM TWO FIELD RECONNAISSANCE WELLS WERE TAKEN.

● INDICATES THE LOCATION OF NESTED well clusters installed by THE NUS CORPORATION FOR THE EPA DURING THE FALL OF 1985/SPRING 1986



NIAGARA COUNTY HEALTH DEPARTMENT

SITE NAME: 64th St.-South (SAMPLING) 5-110	DEC # 932085
DRAWING NOT TO SCALE | DATE:	BY: PAUL DICKS

REFERENCE NO. 4

Uncontrolled Hazardous Waste Site Ranking System

A Users Manual

Kris W. Barrett
S. Steven Chang
Stuart A. Haus
Andrew M. Platt

August 1982

MTR-82W111

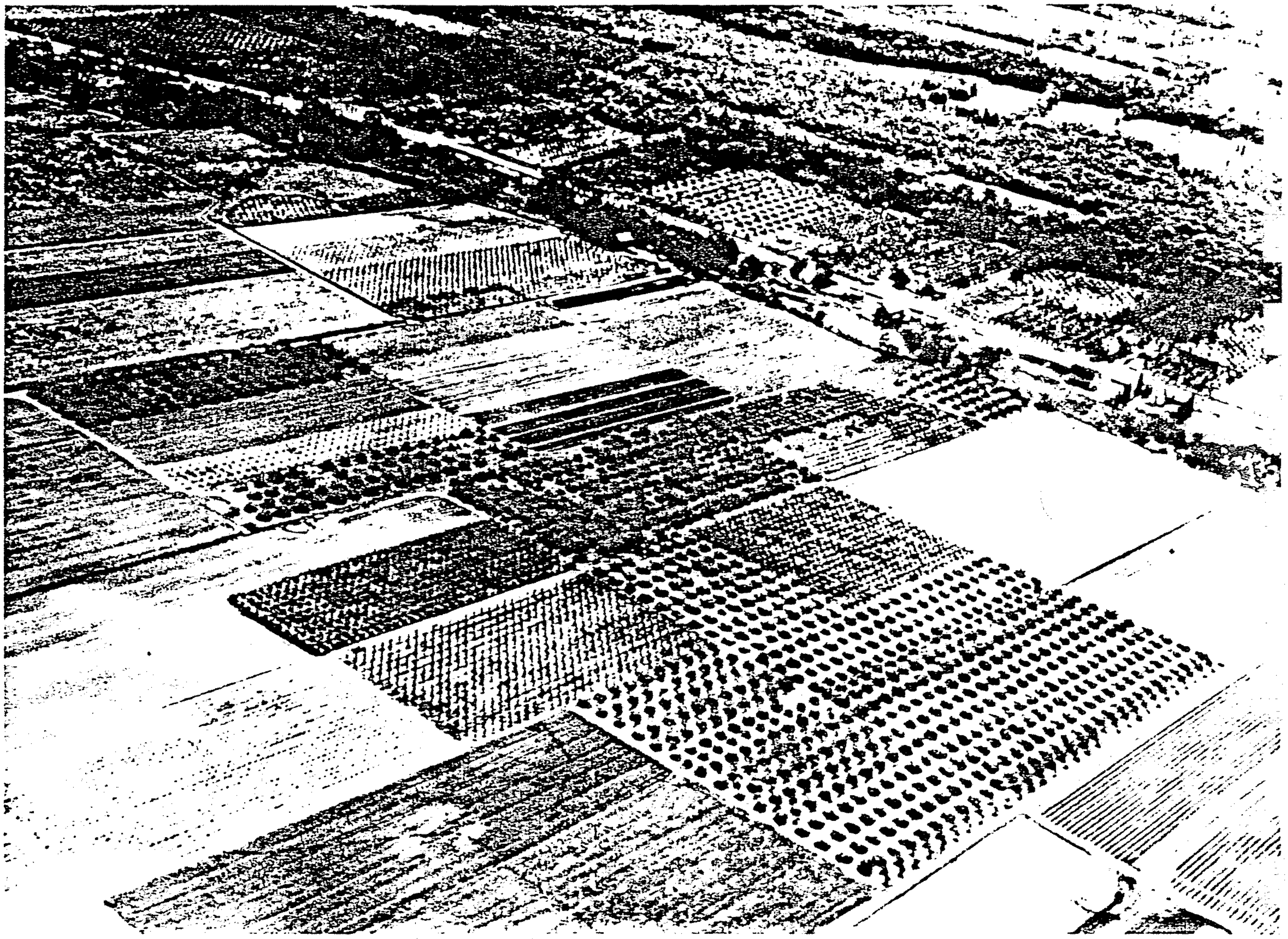
SPONSOR:
U.S. Environmental Protection Agency
CONTRACT NO.:
68-01-6278

The MITRE Corporation
Metrek Division
1820 Dolley Madison Boulevard
McLean, Virginia 22102

REFERENCE NO. 5

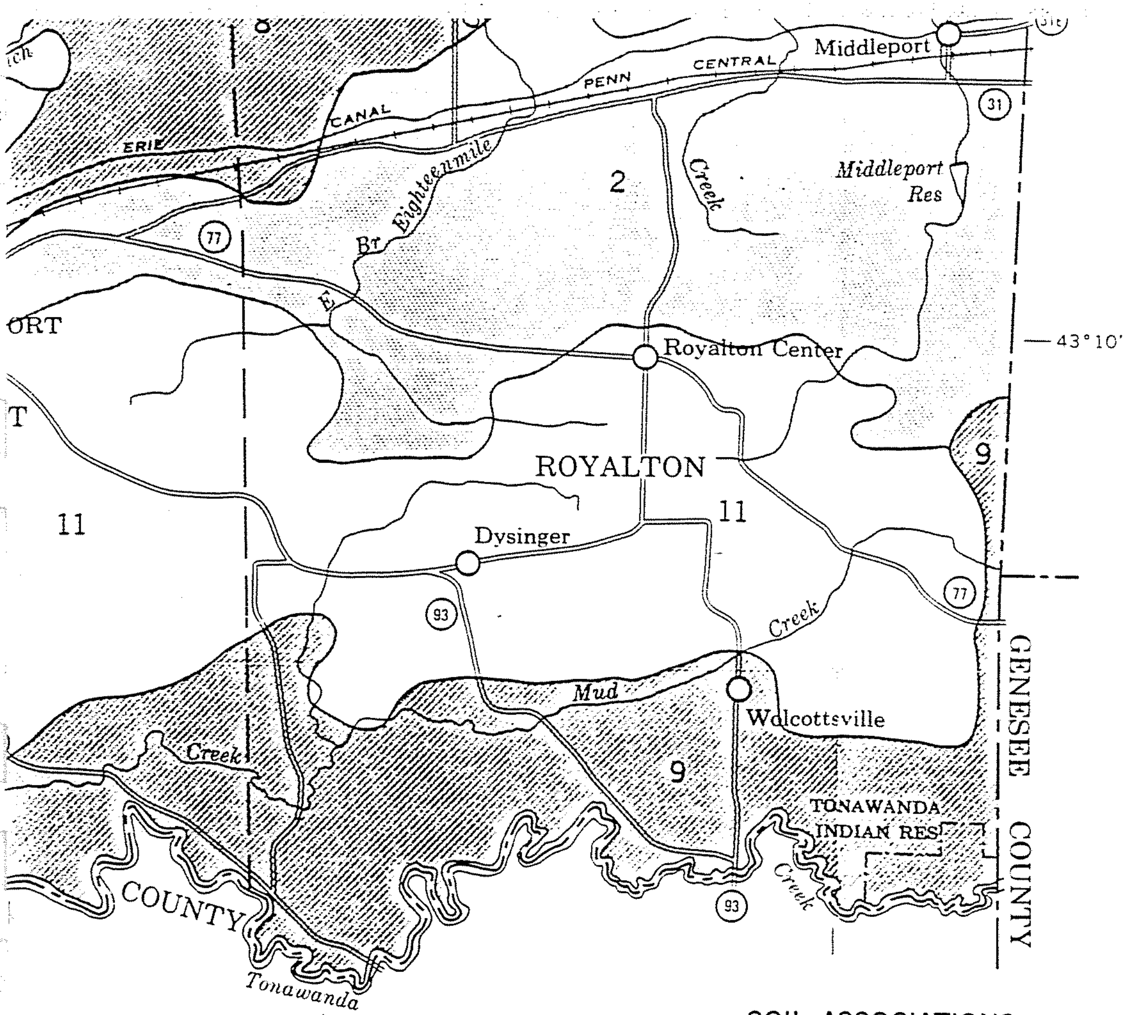
SOIL SURVEY O

Niagara County, New York



United States Department of Agriculture
Soil Conservation Service
In cooperation with
Cornell University Agricultural Experiment Station

Issued October 1972



SOIL ASSOCIATIONS

AREAS DOMINATED BY SOILS FORMED IN GLACIAL TILL

1 Appleton-Hilton-Sun association: Deep, moderately well drained to very poorly drained soils having a medium-textured subsoil

2 Hilton-Ovid-Ontario association: Deep, well-drained to somewhat poorly drained soils having a medium-textured or moderately fine textured subsoil

3 Lockport-Ovid association: Moderately deep and deep, somewhat poorly drained soils having a fine textured or moderately fine textured subsoil

AREAS DOMINATED BY SOILS FORMED IN GRAVELLY GLACIAL OUTWASH OR IN BEACH AND BAR DEPOSITS

4 Howard-Arkport-Phelps association: Deep, somewhat excessively drained to moderately well drained soils having a medium-textured to moderately coarse textured subsoil, over gravel and sand

5 Otisville-Altmar-Fredon-Stafford association: Deep, excessively drained to poorly drained soils having a dominantly medium-textured to coarse-textured subsoil, over gravel and sand

AREAS DOMINATED BY SOILS FORMED IN LAKE-LAID SANDS

6 Minoa-Galen-Elnora association: Deep, somewhat poorly drained and moderately well drained soils having a medium-textured, moderately coarse textured, or coarse textured subsoil, over fine and very fine sand

7 Claverack-Cosad-Elnora association: Deep, moderately well drained and somewhat poorly drained soils having a coarse-textured subsoil, over clay or fine sand

AREAS DOMINATED BY SOILS FORMED IN LAKE-LAID SILTS AND VERY FINE SANDS

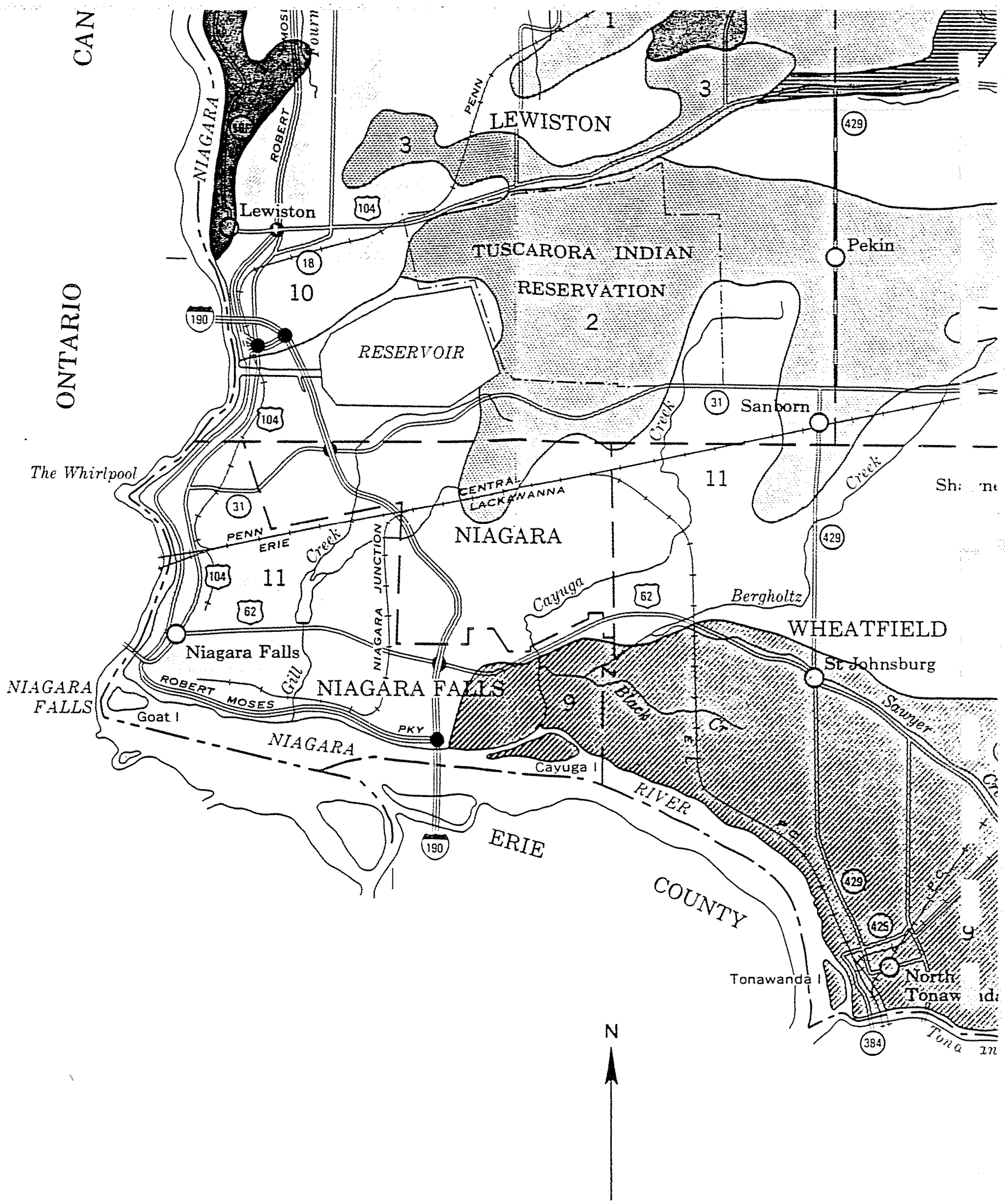
8 Niagara-Collamer association: Deep, somewhat poorly drained and moderately well drained soils having a medium-textured to moderately fine textured subsoil

9 Canandaigua-Raynham-Rhinebeck association: Deep, somewhat poorly drained to very poorly drained soils having a dominantly medium-textured to fine-textured subsoil

AREAS DOMINATED BY SOILS FORMED IN LAKE-LAID CLAYS AND SILTS

10 Rhinebeck-Ovid-Madalin association: Deep, somewhat poorly drained to very poorly drained soils having a fine textured or moderately fine textured subsoil that is dominantly brown or olive in color

11 Odessa-Lakemont-Ovid association: Deep, somewhat poorly drained to very poorly drained soils having a fine textured or moderately fine textured subsoil that is dominantly reddish in color



This map is for general planning. It shows only the major soils and does not contain sufficient detail for operational planning.

Published 1

in the northwestern part of the county near the village of Youngstown. Three smaller areas also occur.

This association makes up about 15 percent of the county. About 32 percent of this is Rhinebeck soils, 10 percent is Ovid soils, and 9 percent is Madalin soils. The remaining 49 percent consists of minor soils.

The Rhinebeck soils are deep and are somewhat poorly drained. These soils typically have a silt loam surface layer, a silty clay or silty clay loam subsoil, and underlying material of varved silt and clay. They occupy the broad areas within the association and are slightly dissected by erosion in a few places, especially in areas that border Lake Ontario.

The Ovid soils occupy the slightly elevated areas where there has been some reworking of the fine-textured lake deposits and the glacial till or glacial beach deposits. The Ovid soils are deep and somewhat poorly drained. They typically have a silt loam surface layer and a silty clay loam subsoil and are underlain by loamy glacial till. Some coarse fragments are generally in and below the surface layer.

The Madalin soils occupy the more nearly level, more depressional areas within the broad, level lake plain. They are deep and poorly drained to very poorly drained. Madalin soils typically have a dark silt loam surface layer that is high in organic-matter content, a silty clay subsoil, and underlying material of varved silt and clay.

The minor soils are mainly of the Collamer, Hudson, and Niagara series. These soils are intermingled with the major soils in this association. The Collamer and Hudson soils occupy knolls or higher elevations and are intermingled with the Ovid soils. The Niagara soils are mainly nearly level.

This association has a medium value for farming. Much of it is idle or is cropland that is not used intensively. A fairly small acreage that is close to Lake Ontario is used intensively for fruit. The area near Youngstown is in community development, mostly for rural homes. The acreage in grapes is increasing, especially near the Model City area in the town of Lewiston.

Natural drainage is the principal concern in town and country planning and in farm development. The flatness of the area is the biggest factor to consider in planning artificial drainage. The soils in most of the association can be drained readily by installing adequate surface ditches. Tile lines help in draining some of the wet, coarser textured inclusions. The major need is group drainage projects that provide suitable outlets.

If drainage is adequate, this association has a good potential for apples, grapes, pears, and other fruit. Peaches and cherries normally are not suited. Some vegetables can be grown intensively, but maintaining soil tilth is difficult. Grain and hay crops are suited if drainage is adequate. The need for lime is generally small.

Natural drainage and slow permeability are the two most limiting factors for community development. Sanitary sewers and adequate surface drainage are needed. In many places the soils are unstable because they formed in deep lake deposits.

About 85 percent of the acreage is in open land. The forested areas consist mostly of scattered farm woodlots. Some of the idle land is reverting to ash, soft maple, and other native hardwoods. Open-land wildlife is plentiful in many areas. Pheasants and rabbits are the most commonly hunted wildlife species, and there is a potential for wetland wildlife. Recreation in this association consists mostly of hunting, fishing, camping, and golfing. Scenic areas are confined mostly to the part of the association that borders the Niagara River and Lake Ontario.

11. Odessa-Lakemont-Ovid association

Deep, somewhat poorly drained to very poorly drained soils having a fine textured or moderately fine textured subsoil that is dominantly reddish in color

This is the largest soil association in Niagara County. It consists of level or nearly level soils on lake plains south of the limestone escarpment (fig. 5). There are two large areas that are dotted with small knolls and ridges of till. The largest area is west of the Barge Canal, and the other area is in the same topographical position as the larger area but is east of the Barge Canal.

This association makes up about 21 percent of the county. About 24 percent of this is Odessa soils, 14 percent is Lakemont soils, and 11 percent is Ovid soils. The remaining 51 percent consists of minor soils.

The Odessa soils are deep and somewhat poorly drained. They typically have a silty clay loam surface layer, a silty clay subsoil, and clay and silt underlying material. These soils are level and occupy the broad areas between the poorly drained, depressional areas and the slightly elevated till ridges.

The Lakemont soils are level to slightly depressional and are generally adjacent to the better drained Odessa soils. Lakemont soils typically have a silty clay loam surface layer, a silty clay subsoil, and underlying material of clay and silt. They have a darker surface layer than the Odessa soils and show more indications of wetness.

The Ovid soils are nearly level to gently undulating and are on till landscapes at slightly higher elevations above the lake plain. They are deep and somewhat poorly drained. Ovid soils typically have a silt loam surface layer, a silty clay loam subsoil, and underlying material of loamy glacial till.

The minor soils are mainly of the Churchville, Cayuga, Cazenovia, Fonda, and Hilton series. Also included are some areas of shallow muck. In many places the moderately well drained Hilton and Cazenovia soils occupy the higher parts of the knolls and

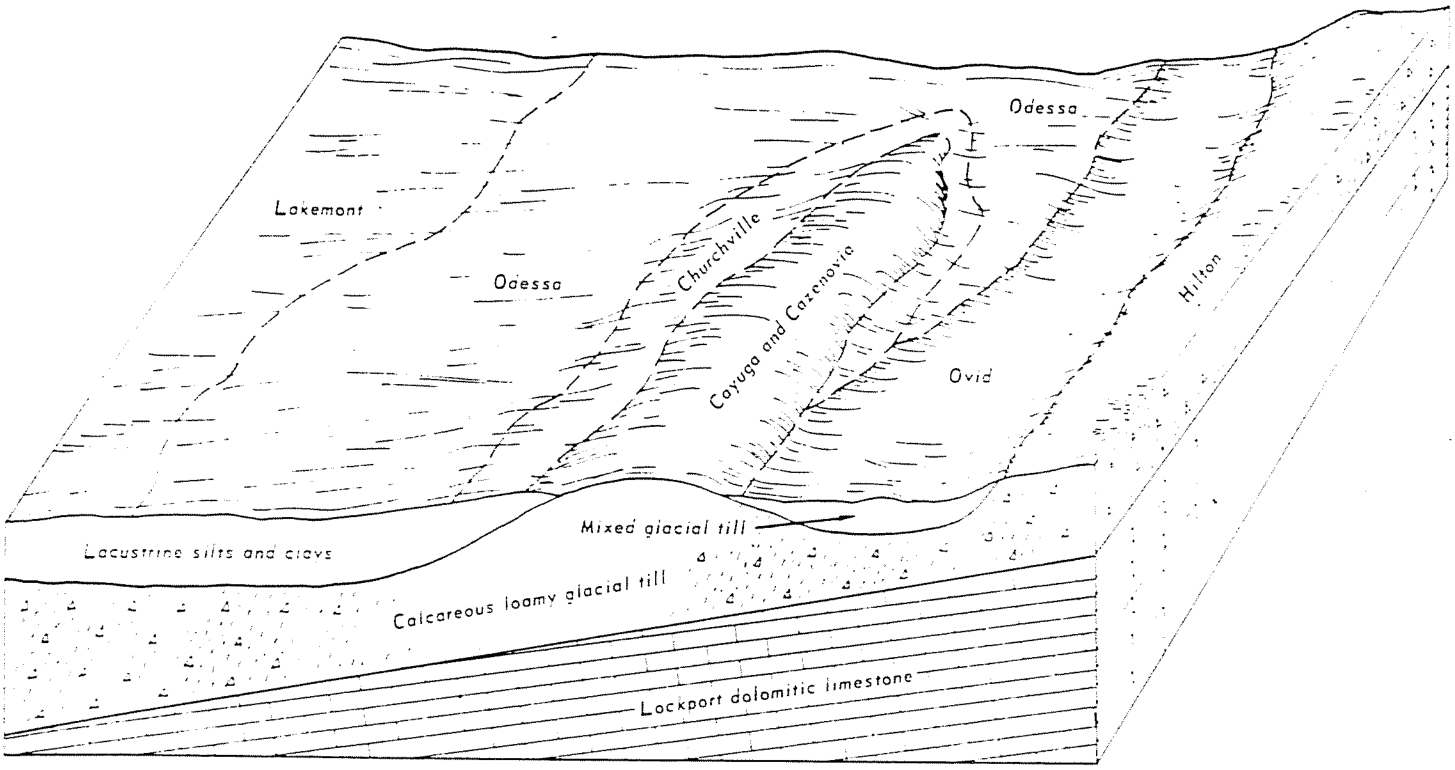


Figure 5.--Typical cross section of the Odessa-Lakemont-Ovid association.

till ridges that are scattered throughout the association. Around the fringes of these areas, where lacustrine clays overlap the till, are the somewhat poorly drained Churchville soils and the moderately well drained Cayuga soils. The very poorly drained Fonda soils and the shallow muck occupy some of the deeper depressions in the lake plain.

This association has a fairly low value for farming. Much of it is idle or cropland that is not intensively used. Communities are being rapidly developed in the western part of the association near Niagara Falls and in areas south of Lockport. The Conservation Needs Inventory for 1958 indicated that 58 percent of this association is cropland, 6 percent is pasture, 4 percent is forest, 14 percent is urban or built-up areas, and 18 percent is open land (6).

Natural drainage is the main concern in town and county planning and in agricultural development. The flatness of the area and the generally fine texture of the soils are the main factors to consider before installing artificial drainage. The biggest need is for group drainage projects that provide suitable outlets.

If adequately drained, the soils in this association have a good potential for grain and for dairy cattle and other livestock. The texture of the soils is generally too fine for most vegetable crops. If the soils are cultivated intensively, they are difficult to till because they crust, clod, and compact. Most fruit crops are damaged by frost in this association. The need for lime is small.

REFERENCE NO. 6

NUS CORPORATION
RARITAN PLAZA III, FIELDCREST AVENUE
EDISON, NEW JERSEY 08837
201-225-6160

our 25th year

SEP 30 RECD

C-584-09-85-15

September 5, 1985

Ms. Diana Messina
U.S. Environmental Protection Agency
Region II
Edison, New Jersey 08837

Dear Diana:

Enclosed are the final analytical results for samples collected at the 64th Street Dump-South site in Niagara Falls, New York. A boring/sampling program was conducted on June 11, 1985 (following a magnetometer survey on 6/10) as directed under TDD #02-8505-07.

Seven (7) locations were selected for sampling at the surface and at depths of two and five feet below the surface. In addition, four (4) soil samples were collected from areas indicating anomalies on the magnetometer survey.

Results indicate that most contaminants detected were present in the surface soil (0" - 3"). A variety of polyaromatic hydrocarbons and phthalates were detected in concentrations ranging from trace quantities to 61,000 ug/kg throughout the former disposal area. Pesticides were detected at concentrations ranging from trace quantities to 330 ug/kg along the northern, western, and southern boundaries of the study area.

Very truly yours,

Neil Myers

Neil Myers

Approved: ______________________

NM/mg

Enclosure

ANALYTICAL DATA
64TH STREET DUMP-SOUTH
SAMPLING DATE: 6/10/85
CASE: 4460/1730D

VOLATILES

SAMPLE NUMBER MATRIX UNITS	NYA1-S1A SOIL UG/KG	NYA1-S1B SOIL UG/KG	NYA1-S1C SOIL UG/KG	NYA1-S2A SOIL UG/KG	NYA1-S2B SOIL UG/KG	NYA1-S2C SOIL UG/KG	NYA1-S3A SOIL UG/KG	NYA1-S3B SOIL UG/KG	NYA1-S3C SOIL UG/KG
Chloromethane									
Bromomethane									
Vinyl Chloride									
Chloroethane									
Methylene Chloride	50B	38B	29B	82B	32B	30B	40B	38B	49B
Acetone	E	E	E	30					
Carbondisulfide									
1,1-Dichloroethene									
1,2-Dichloroethane									
Trans-1,2-Dichloroethene									
Chloroform									
1,2-Dichloroethane									
2-Butanone									
1,1,1-Trichloroethane									
Carbon Tetrachloride									
Vinyl Acetate									
Bromodichloromethane									
1,1,2,2-Tetrachloroethane									
1,2-Dichloropropane									
Trans-1,3-Dichloropropene									
Trichloroethene									
Dibromochloromethane									
1,1,2-Trichloroethane									
Benzene									
Cis-1,3-Dichloropropene									
2-Chloroethylvinylether									
Bromoform									
2-Hexanone									
4-Methyl-2-Pentanone									
Tetrachloroethene									
Toluene									
Chlorobenzene									
Ethylbenzene									
Styrene									
Total Xylenes									

NOTES:
Blank space - compound analyzed for but not detected
E - analysis did not pass QA/QC requirements
J - compound present below the specified detection limit
B - compound found in blank as well as the sample, indicates possible/probable blank contamination

ANALYTICAL DATA
24TH STREET DUMP-SOUTH
SAMPLING DATE: 6/10/85
CASE: 4460/1730B

SEMI-VOLATILES									
SAMPLE NUMBER	NYA1-91A	NYA1-91B	NYA1-91C	NYA1-92A	NYA1-92B	NYA1-92C	NYA1-93A	NYA1-93B	NYA1-93C
MATRIX	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
UNITS	UG/KO	UO/KO	UO/KO	UO/KO	UO/KO	UO/KO	UO/KO	UO/KO	UO/KO
N-Nitrosodimethylamine									
Phenol									
Aniline									
Bis(2-Chloroethyl)Ether									
2-Chlorophenol									
1,3-Dichlorobenzene									
1,4-Dichlorobenzene									
Benzyl Alcohol									
1,2-Dichlorobenzene									
2-Methylphenol									
Bis(2-Chloroisopropyl)Ether									
4-Methylphenol									
N-Nitroso-Di n-Propylamine									
Hexachloroethane									
Nitrobenzene									
Isophorone									
2-Nitrophenol									
2,4-Dimethylphenol									
Benzoic Acid									
Bis(2-Chloroethoxy)Methane									
2,4-Dichlorophenol									
1,2,4-Trichlorobenzene									
Naphthalene	J			J			J	J	
4-Chloroaniline									
Hexachlorobutadiene									
4-Chloro-3-Methylphenol									
2-Methylnaphthalene	J						J	J	
Hexachlorcyclopentadiene									
2,4,6-Trichlorophenol									
2,4,5-Trichlorophenol									
2-Chloronaphthalene									
2-Nitroaniline									
Dimethyl Phthalate									
Acenaphthylene									
3-Nitroaniline									
Acenaphthene	J			E			J	J	
2,4-Dinitrophenol									
4-Nitrophenol									
Dibenzofuran	J			J			J		
2,4-Dinitrotoluene									
2,6-[illegible]tr[illegible]ene									
Diethyl Phthalate									

ANALYTICAL DATA
64TH STREET DUMP-SOUTH
SAMPLING DATE: 6/10/85
CASE: 4460/1730B

SEMI-VOLATILES

SAMPLE NUMBER MATRIX UNITS	NYA1-S1A SOIL UG/KG	NYA1-S1B SOIL UG/KG	NYA1-S1C SOIL UG/KG	NYA1-S2A SOIL UG/KG	NYA1-S2B SOIL UG/KG	NYA1-S2C SOIL UG/KG	NYA1-S3A SOIL UG/KG	NYA1-S3B SOIL UG/KG	NYA1-S3C SOIL UG/KG
4,6-Dinitro-2-Methylphenol									
N-Nitrosodiphenylamine									
4-Bromophenyl-Phenylether									
Hexachlorobenzene									
Pentachlorophenol									
Phenanthrene	1100	J		1200			1400	590	1400
Anthracene	J	J		J			J	J	410
Di-n-Butylphthalate									
Fluoranthene	1300	390		1700			1000	610	1000
Benzidine									
Pyrene	1300	410		1900			1600	760	1800
Butylbenzylphthalate									
3,3'-Dichlorobenzidine									
Benzo(a)Anthracene	850	J		910			1100	390	1100
bis(2-Ethylhexyl)Phthalate	J			J			J		2500
Chrysene	900	J		1000			1200	450	1200
Di-n-Octyl Phthalate									
Benzo(b)Fluoranthene	1000	J		1400			1600	570	1500
Benzo(K)Fluoranthene	830	J		1000			1100	300	1400**
Benzo(a)Pyrene	E	J		1200			1200	410	1300
Indeno(1,2,3-cd)Pyrene		J		840			810	J	710
Dibenzo(a,h)Anthracene							J		
Benzo(ghi)Perylene		J		740			E	E	

NOTES:
Blank space - compound analyzed for but not detected
E - analysis did not pass QA/QC requirements
J - compound present below the specified detection limit

ANALYTICAL DATA
64TH STREET DUMP-SOUTH
SAMPLING DATE: 6/10/85
CASE: 4460/17308

INORGANICS									
SAMPLE NUMBER	NYA1-S1A	NYA1-S1B	NYA1-S1C	NYA1-S2A	NYA1-S2B	NYA1-S2C	NYA1-S3A	NYA1-S3B	NYA1-S3C
MATRIX	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
UNITS	MG/KG	MG/KG	MG/KG	MG/KG	MG/KG	MG/KG	MG/KG	MG/KG	MG/KG
Aluminum	9160	9320	9290	7900	4700	8940	9730	12900	5390
Antimony									
Arsenic	8.2	10	9.6	7.4	J	6.7	12	15	20
Barium	119	J	J	J	J	J	J	J	436
Beryllium	J	J	J	J	J	J	J	J	J
Cadmium									4.4
Calcium	11800	20600	19100	J	21800	15600	25100	22900	12200
Chromium	63	34	20	18	9.1	15	53	47	52
Cobalt	J	J	J	J	J	J	J	J	J
Copper	25	26	24	18	15	21	48	43	74
Iron	16500	17800	18400	13700	12100	18600	29800	23000	47600
Lead	J	J	12	14	6.1	8.5	J	J	J
Magnesium	6530	8450	7220	J	8300	6040	8650	7890	3500
Manganese	605	425	245	185	249	291	782	597	487
Mercury	0.59	0.40		0.19			0.38	0.20	0.65
Nickel	30	J	J	J	J	J	37	28	45
Potassium	J	J	J	J	J	J	3000	4170	J
Selenium									
Silver		J	J	J			J	J	J
Sodium	E	E		E				E	E
Thallium									
Tin									62
Vanadium	31	J	J	J	J	J	36	44	J
Zinc	92	94	69	62	18	55	147	100	1100

NOTES:
Blank space - compound analyzed for but not detected
E - analysis did not pass QA/QC requirements
J - compound present below the specified detection limit

ANALYTICAL DATA
64TH STREET DUMP-SOUTH
SAMPLING DATE: 6/10/85
CASE: 4460/1730B

VOLATILES									
SAMPLE NUMBER	NYA1-S4A	NYA1-S4B	NYA1-S4C	NYA1-S5A	NYA1-S5B	NYA1-S5C	NYA1-S6A	NYA1-S6B	NYA1-S6C
MATRIX	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
UNITS	UG/KG	UG/KG	UG/KG	UG/KG	UG/KG	UG/KG	UG/KG	UG/KG	UG/KG
Chloromethane									
Bromomethane									
Vinyl Chloride									
Chloroethane									
Methylene Chloride	40	36B	25	44	63	60B	60	35B	E
Acetone	E		29	17	E	E	E	E	100B
Carbondisulfide									
1,1-Dichloroethene									
1,2-Dichloroethane									
Trans-1,2-Dichloroethene									
Chloroform									
1,2-Dichloroethane									
2-Butanone									
1,1,1-Trichloroethane									
Carbon Tetrachloride									
Vinyl Acetate									
Bromodichloromethane									
1,1,2,2-Tetrachloroethane									
1,2-Dichloropropane									
Trans-1,3-Dichloropropene									
Trichloroethene									
Dibromochloromethane									
1,1,2-Trichloroethane									
Benzene									
Cis-1,3-Dichloropropene									
2-Chloroethylvinylether									
Bromoform									
2-Hexanone									
4-Methyl-2-Pentanone									
Tetrachloroethene									
Toluene									
Chlorobenzene									
Ethylbenzene									
Styrene									
Total Xylenes									

NOTES:
Blank space - compound analyzed for but not detected
E - analysis did not pass QA/QC requirements
[illegible] the specified detection limit

ANALYTICAL DATA
64TH STREET DUMP SOUTH
SAMPLING DATE: 6/10/85
CASE: 4460/1730D

SEMI-VOLATILES

SAMPLE NUMBER	NYA1-S4A	NYA1-S4B	NYA1-S4C	NYA1-S5A	NYA1-S5B	NYA1-S5C	NYA1-S6A	NYA1-S6B	NYA1-S6C
MATRIX	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
UNITS	UG/KG	UG/KG	UG/KG	UG/KG	UG/KG	UG/KG	UG/KG	UG/KG	UG/KG
N-Nitrosodimethylamine									
Phenol									
Aniline									
bis(2-Chloroethyl)Ether									
2-Chlorophenol									
1,3-Dichlorobenzene									
1,4-Dichlorobenzene									
Benzyl Alcohol									
1,2-Dichlorobenzene									
2-Methylphenol									
bis(2-Chloroisopropyl)Ether									
4-Methylphenol									
N-Nitroso-Di-n-Propylamine									
Hexachloroethane									
Nitrobenzene									
Isophorone									
2-Nitrophenol									
2,4-Dimethylphenol									
Benzoic Acid									
bis(2-Chloroethoxy)Methane									
2,4-Dichlorophenol									
1,2,4-Trichlorobenzene									
Naphthalene				400		J			
4-Chloroaniline									
Hexachlorobutadiene									
4-Chloro-3-Methylphenol									
2-Methylnaphthalene				J					
Hexachlorocyclopentadiene									
2,4,6-Trichlorophenol									
2,4,5-Trichlorophenol									
2-Chloronaphthalene									
2-Nitroaniline									
Dimethyl Phthalate									
Acenaphthylene									
3-Nitroaniline									
Acenaphthene	J			490					
2,4-Dinitrophenol									
4-Nitrophenol									
Dibenzofuran				J					
2,4-Dinitrotoluene									
2,6-Dinitrotoluene									
[illegible] Phthalate									

ANALYTICAL DATA
64TH STREET DUMP SOUTH
SAMPLING DATE: 6/10/85
CASE: 4460/1730D

SEMI-VOLATILES

SAMPLE NUMBER MATRIX UNITS	NYA1-S4A SOIL UG/KG	NYA1-S4B SOIL UG/KG	NYA1-S4C SOIL UG/KG	NYA1-S5A SOIL UG/KG	NYA1-S5B SOIL UG/KG	NYA1-S5C SOIL UG/KG	NYA1-S6A SOIL UG/KG	NYA1-S6B SOIL UG/KG	NYA1-S6C SOIL UG/KG
4,6-Dinitro-2-Methylphenol									
N-Nitrosodiphenylamine									
4-Bromophenyl-Phenylether									
Hexachlorobenzene									
Pentachlorophenol									
Phenanthrene	1200			2600	2100	590	400		
Anthracene	J			660	490	J	J		
Di-n-Butylphthalate									
Fluoranthene	1900			3500	2600	570	670	J	
Benzidine									
Pyrene	1300			2800	2200	480	730	J	
Butylbenzylphthalate							J		
3,3'-Dichlorobenzidine									
Benzo(a)Anthracene	1000			2400		J	J		
bis(2-Ethylhexyl)Phthalate				490	2300	510	J		
Chrysene	1100			2700	1600	J	410		
Di-n-Octyl Phthalate									
Benzo(b)Fluoranthene	970			3000	2300	510	E		
Benzo(K)Fluoranthene	790			2600	1600	J	550		
Benzo(a)Pyrene	990			2900	1900	J	460		
Indeno(1,2,3-cd)Pyrene	400			1200	830		400		
Dibenzo(a,h)Anthracene	J			400					
Benzo(ghi)Perylene	420			1200	E		J		

NOTES:
Blank space - compound analyzed for but not detected
E - analysis did not pass QA/QC requirements
J - compound present below the specified detection limit

ANALYTICAL DATA
64TH STREET DUMP-SOUTH
SAMPLING DATE: 6/10/85
CASE: 4460/1730B

PESTICIDES/PCBs									
SAMPLE NUMBER	NYA1-S4A	NYA1-S4B	NYA1-S4C	NYA1-S5A	NYA1-S5B	NYA1-S5C	NYA1-S6A	NYA1-S6B	NYA1-S6C
MATRIX	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
UNITS	UG/KG	UG/KG	UG/KG	UG/KG	UG/KG	UG/KG	UG/KG	UG/KG	UG/KG
Alpha-BHC				23			35	E	13
Beta-BHC				330			40	E	18
Delta-BHC									
Gamma-BHC (Lindane)									
Heptachlor									
Aldrin									
Heptachlor Epoxide									
Endosulfan I									
Dieldrin									
4,4'-DDE									
Endrin									
Endosulfan II									
4,4'-DDD									
Endrin Aldehyde									
Endosulfan sulfate									
4,4'-DDT									
Methoxychlor									
Endrin Ketone									
Chlordane									
Toxaphene									
Arochlor-1016									
Arochlor-1221									
Arochlor-1232									
Arochlor-1242									
Arochlor-1248									
Arochlor-1254									
Arochlor-1260									

NOTES:
Blank space - compound analyzed for but not detected
E - analysis did not pass QA/QC requirements
J - compound present below the specified detection limit

ANALYTICAL DATA
64TH STREET DUMP-SOUTH
SAMPLING DATE: 6/10/85
CASE: 4460/1730B

INORGANICS									
SAMPLE NUMBER	NYA1-S4A	NYA1-S4B	NYA1-S4C	NYA1-S5A	NYA1-S5D	NYA1-S5C	NYA1-S6A	NYA1-S6B	NYA1-S6C
MATRIX	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
UNITS	MG/KG	MG/KG	MG/KG	MG/KG	MG/KG	MG/KG	MG/KG	MG/KG	MG/KG
Aluminum	13100	7400	8750	10100	8900	9610	7010	7230	6040
Antimony									
Arsenic	14	10	10	13	18	12	6.5	J	J
Barium	149	J	J	246	172	157	J	J	J
Beryllium	J	J	J	J	J	J	J	J	J
Cadmium				3.2	3.8				
Calcium	19200	J	9060	16500	22700	15200	4330	45800	43400
Chromium	27	13	17	41	43	39	12	13	11
Cobalt	J	J	J	J	J	J	J	J	J
Copper	34	21	20	34	93	63	J	16	J
Iron	22000	17900	10500	10800	25500	21500	14800	15200	14300
Lead	J	9	14	J	J	J	E	E	E
Magnesium	12400	J	5220	7550	6710	5460	3190	20900	9960
Manganese	730	267	261	972	620	304	365	346	317
Mercury	0.64		J	J	J	J			
Nickel	30	J	J	35	31	28	J	J	J
Potassium	J	J	J	J	J	J	J	J	J
Selenium									
Silver					J				
Sodium	E	E	E		J	J		J	J
Thallium									
Tin									
Vanadium	30	J	J	42	37	J	J	J	J
Zinc	252	67	74	501	337	296	57	74	53

NOTES:
Blank space - compound analyzed for but not detected
E - analysis did not pass QA/QC requirements
J - compound present below the specified detection limit

ANALYTICAL DATA
64TH STREET DUMP-SOUTH
SAMPLING DATE: 6/10/85
CASE: 4460/1730D

VOLATILES								
SAMPLE NUMBER	NYA1-S7A	NYA1-S7B	NYA1-S7C	NYA1-S8	NYA1-S9	NYA1-S10	NYA1-S11	NYA1-S8
MATRIX	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
UNITS	UG/KG	UG/KG	UG/KG	UG/KG	UG/KG	UG/KG	UG/KG	UG/KG
Chloromethane								
Bromomethane								
Vinyl Chloride								
Chloroethane								
Methylene Chloride	67	37B	E	28B	E	34B	26B	9.3B
Acetone	12	E	E	290B	E	E	E	
Carbondisulfide								
1,1-Dichloroethene								
1,2-Dichloroethane								
Trans-1,2-Dichloroethene								
Chloroform								
1,2-Dichloroethane								
2-Butanone								
1,1,1-Trichloroethane								
Carbon Tetrachloride								
Vinyl Acetate								
Bromodichloromethane								
1,1,2,2-Tetrachloroethane								
1,2-Dichloropropane								
Trans-1,3-Dichloropropene								
Trichloroethene	E	6.9						
Dibromochloromethane								
1,1,2-Trichloroethane								
Benzene								
Cis-1,3-Dichloropropene								
2-Chloroethylvinylether								
Bromoform								
2-Hexanone								
4-Methyl-2-Pentanone								
Tetrachloroethane	J							
Toluene	J							
Chlorobenzene								
Ethylbenzene								
Styrene								
Total Xylenes								

NOTES:
Blank space - compound analyzed for but not detected
[illegible] analysis did not pass QA/QC requirements

ANALYTICAL DATA
64TH STREET DUMP-SOUTH
SAMPLING DATE: 6/10/85
CASE: 4460/1730D

SEMI-VOLATILES

SAMPLE NUMBER MATRIX UNITS	NYA1-S7A SOIL UG/KG	NYA1-S7B SOIL UG/KG	NYA1-S7C SOIL UG/KG	NYA1-S8 SOIL UG/KG	NYA1-S9 SOIL UG/KG	NYA1-S10 SOIL UG/KG	NYA1-S11 SOIL UG/KG
N-Nitrosodimethylamine							
Phenol							
Aniline							
Bis(2-Chloroethyl)Ether							
2-Chlorophenol							
1,3-Dichlorobenzene							
1,4-Dichlorobenzene							
Benzyl Alcohol							
1,2-Dichlorobenzene							
2-Methylphenol							
Bis(2-Chloroisopropyl)Ether							
4-Methylphenol							
N-Nitroso-Di-n-Propylamine							
Hexachloroethane							
Nitrobenzene							
Isophorone							
2-Nitrophenol							
2,4-Dimethylphenol							
Benzoic Acid							
Bis(2-Chloroethoxy)Methane							
2,4-Dichlorophenol							
1,2,4-Trichlorobenzene							
Naphthalene					J	450	
4-Chloroaniline							
Hexachlorobutadiene							
4-Chloro-3-Methylphenol							
2-Methylnaphthalene							
Hexachlorocyclopentadiene							
2,4,6-Trichlorophenol							
2,4,5-Trichlorophenol							
2-Chloronaphthalene							
2-Nitroaniline							
Dimethyl Phthalate							
Acenaphthylene							
3-Nitroaniline							
Acenaphthene		J		J	J	530	
2,4-Dinitrophenol							
4-Nitrophenol							
Dibenzofuran							
2,4-Dinitrotoluene							
2,6-Dinitrotoluene							

ANALYTICAL DATA
64TH STREET DUMP-SOUTH
SAMPLING DATE: 6/10/85
CASE: 4460/1730B

SEMI-VOLATILES

SAMPLE NUMBER MATRIX UNITS	NYA1-87A SOIL UG/KG	NYA1-87B SOIL UG/KG	NYA1-87C SOIL UG/KG	NYA1-88 SOIL UG/KG	NYA1-89 SOIL UG/KG	NYA1-810 SOIL UG/KG	NYA1-811 SOIL UG/KG
4,6-Dinitro-2-Methylphenol							
N-Nitrosodiphenylamine							
4-Bromophenyl-Phenylether							
Hexachlorobenzene							
Pentachlorophenol							
Phenanthrene	36000	1300	410	920	550	3600	1300
Anthracene	J	J	J	J	J	820	410
Di-n-Butylphthalate		J	J				
Fluoranthene	50000	1900	480	1300	660	4600	2200
Benzidine							
Pyrene	61000	1700	J	1000	610	4300	3000
Butylbenzylphthalate							
3,3'-Dichlorobenzidine							
Benzo(a)Anthracene	J	670	J	600	460	2900	1400
bis(2-Ethylhexyl)Phthalate		J			J	1800	1000
Chrysene	J	750	J	710	520	2900	1500
Di-n-Octyl Phthalate							
Benzo(b)Fluoranthene	J	860	J	670	570	3300	E
Benzo(K)Fluoranthene	26000	680	J	680	450	2800	E
Benzo(a)Pyrene	J	670	J	690	500	3200	1600
Indeno(1,2,3-cd)Pyrene		J		J	440	1600	
Dibenzo(a,h)Anthracene				J	400	560	
Benzo(ghi)Perylene		J		J		1700	

NOTES:
Blank space - compound analyzed for but not detected
E - analysis did not pass QA/QC requirements
J - compound present below the specified detection limit

ANALYTICAL DATA
64TH STREET DUMP-SOUTH
SAMPLING DATE: 6/10/85
CASE: 4460/1730B

PESTICIDES/PCBs							
SAMPLE NUMBER	NYA1-S7A	NYA1-S7B	NYA1-S7C	NYA1-S8	NYA1-S9	NYA1-S10	NYA1-S11
MATRIX	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
UNITS	UG/KG	UG/KG	UG/KG	UG/KG	UG/KG	UG/KG	UG/KG
Alpha-BHC				110			J
Beta-BHC							
Delta-BHC							
Gamma-BHC (Lindane)							
Heptachlor							
Aldrin							
Heptachlor Epoxide							
Endosulfan I							
Dieldrin							
4,4'-DDE							
Endrin							
Endosulfan II							
4,4'-DDD						E	
Endrin Aldehyde							
Endosulfan sulfate							180
4,4'-DDT							
Methoxychlor							
Endrin Ketone							
Chlordane							
Toxaphene							
Arochlor-1016							
Arochlor-1221							
Arochlor-1232							
Arochlor-1242							
Arochlor-1248							
Arochlor-1254							
Arochlor-1260							

NOTES:
Blank space - compound analyzed for but not detected
E - analysis did not pass QA/QC requirements
J - compound present below the specified detection limit

ANALYTICAL DATA
64TH STREET DUMP-SOUTH
SAMPLING DATE: 6/10/85
CASE: 4460/1730D

INORGANICS

SAMPLE NUMBER MATRIX UNITS	NYA1-S7A SOIL MG/KG	NYA1-S7B SOIL MG/KG	NYA1-S7C SOIL MG/KG	NYA1-S8 SOIL MG/KG	NYA1-S9 SOIL MG/KG	NYA1-S10 SOIL MG/KG	NYA1-S11 SOIL MG/KG
Aluminum	14200	7920	7300	14800	11600	6050	6900
Antimony							
Arsenic	14	9.6	J	16	15	12	11
Barium	457	228	J	J	125	189	115
Beryllium	J	J	J	J	J	J	J
Cadmium	5						
Calcium	28800	45200	15500	46600	21600	62900	14900
Chromium	33	16	12	36	160	67	37
Cobalt	J	J	J	J	J	J	J
Copper	47	24	J	30	29	79	29
Iron	24200	16300	15200	21800	19100	17500	13900
Lead	J	J	E	J	J	J	J
Magnesium	14700	10600	5180	26300	9380	21100	6740
Manganese	667	404	109	863	777	899	759
Mercury	J	J		J	J	J	J
Nickel	42	J	J	25	30	37	31
Potassium	J	J	J	2730	J	J	J
Selenium							
Silver	J				J		
Sodium	J	J	J	J	J	J	J
Thallium							
Tin							
Vanadium	52	J	J	36	34	J	44
Zinc	235	107	48	205	130	382	169

NOTES:
Blank space - compound analyzed for but not detected
E - analysis did not pass QA/QC requirements
J - compound present below the specified detection limit

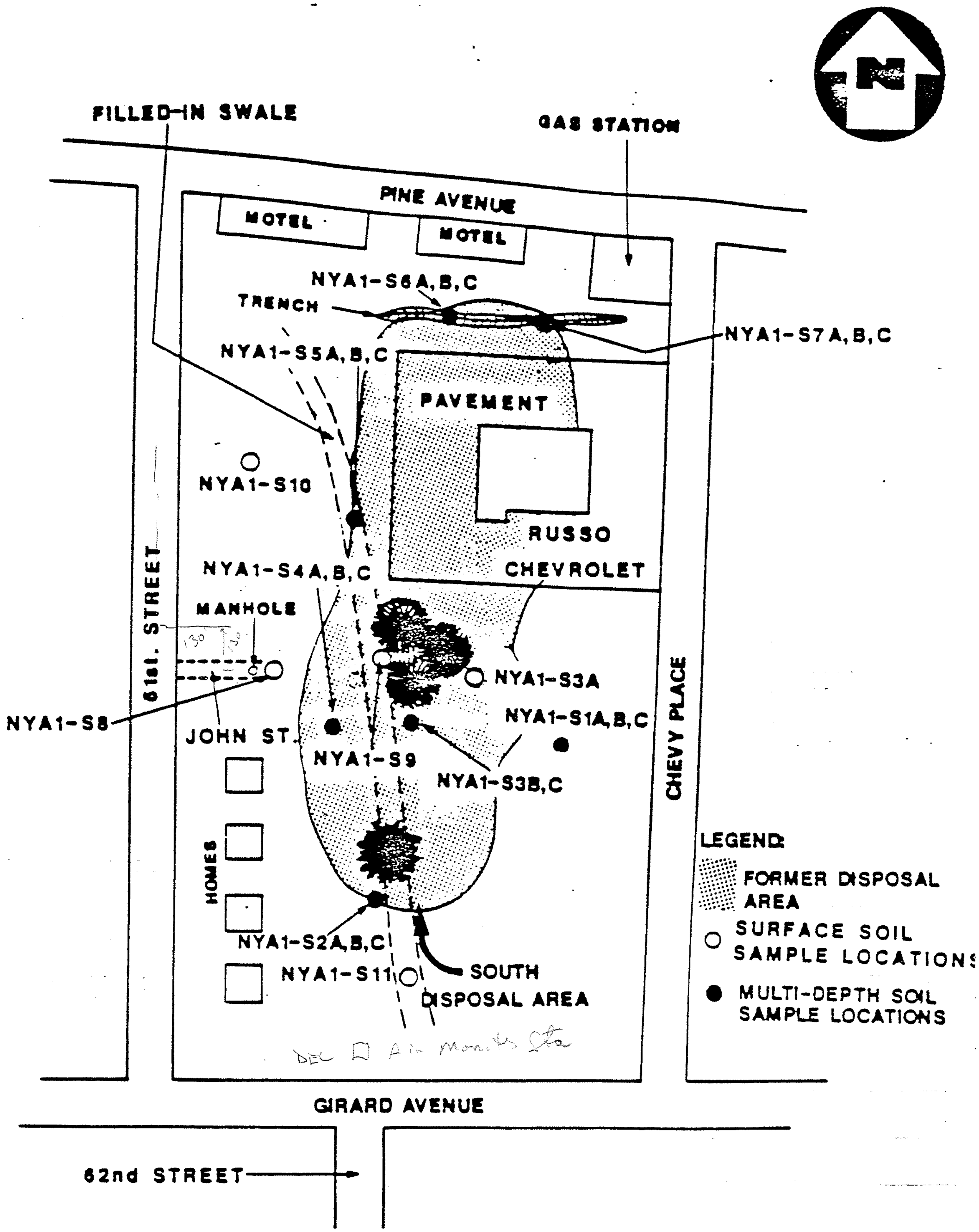


FIGURE 2

SAMPLE LOCATION MAP
64th STREET DUMP-SOUTH, NIAGARA FALLS, NEW YORK
(NOT TO SCALE)

NUS CORPORATION
A Halliburton Company

REFERENCE NO. 7

Dangerous Properties of Industrial Materials

Sixth Edition

N. IRVING SAX

Assisted by:
Benjamin Feiner/Joseph J. Fitzgerald/Thomas J. Haley/Elizabeth K. Weisburger

VNR VAN NOSTRAND REINHOLD COMPANY
NEW YORK CINCINNATI TORONTO LONDON MELBOURNE

TABLE I

EPA Hazard Ranking System Waste Characteristics Values (Toxicity/Persistence Matrix)

Chemical/Compound	Ground Water and Surface Water Pathway Values	Air Pathway Values
Acenapthene	9	3
Acetaldehyde	6	6
Acetic Acid	6	6
Acetone	6	6
2-Acetylaminoflourene	18	9
Aldrin	18	9
Ammonia	9	9
Aniline	12	9
Anthracene	15	9
Arsenic	18	9
Arsenic Acid	18	9
Arsenic Trioxide	18	9
Asbestos	15	9
Barium	18	9
Benzene	12	9
Benzidine	18	9
Benzoapyrene	18	9
Benzopyrene, NOS	18	9
Beryllium & Compounds NOS	18	9
Beryllium Dust, NOS	18	9
Bis (2-Chloroethyl) Ether	15	9
Bis (2-Ethylhexyl Phthalate	12	3
Bromodichloromethane	15	6
Bromoform	15	6
Bromomethane	15	9
Cadmium	18	9
Carbon Tetrachloride	18	9
Chlordane	18	9
Chlorobenzene	12	6
Chloroform	18	6
3-Chlorophenol	12	6
4-Chlorophenol	15	9
2-Chlorophenol	12	6
Chromium	18	9
Chromium, Hexavalent (Cr^{+6})	18	9

Table I (cont.)

Chemical/Compound	Ground Water and Surface Water Pathway Values	Air Pathway Values
Chromium, Trivalent (Cr^{+3})	15	6
Copper & Compounds, NOS	18	9
Creosote	15	6
Cresols	9	6
4-Cresol	12	9
Cupric chloride	18	9
Cyanides (soluble salts), NOS	12	9
Cyclohexane	12	6
DDE	18	9
DDT	18	9
Diaminotoluene	18	6
Dibromochloromethane	15	6
1, 2-Dibromo, 3-chloropropane	18	9
Di-N-Butyl-Phthalate	18	6
1, 4-Dichlorobenzene	15	6
Dichlorobenzene, NOS	18	6
1, 1-Dichloroethane	12	6
1, 2-Dichloroethane	12	9
1, 1-Dichloroethene	15	9
1, 2-cis-Dichloroethylene	12	3
1, 2-trans-Dichloroethylene	12	3
Dichloroethylene, NOS	12	3
2, 4-Dichlorophenol	18	6
2, 4-Dichlorophenoxyacetic Acid	18	9
Dicyclopentadiene	18	9
Dieldrin	18	9
2, 4-Dinitrotoluene	15	9
Dioxin	18	9
Endosulfan	18	9
Endrin	18	9
Ethylbenzene	9	6
Ethylene Dibromide	18	9
Ethylene Glycol	9	6
Ethyl Ether	15	3
Ethylmethacrylate	12	6

Chemical/Compound	Ground Water and Surface Water Pathway Values	Air Pathway Values
Fluorine	18	9
Formaldehyde	9	9
Formic Acid	9	6
Heptachlor	18	9
Hexachlorobenzene	15	6
Hexachlorobutadiene	18	9
Hexachlorocyclohexane, NOS	18	9
Hexachlorocyclopentadiene	18	9
Hydrochloric Acid	9	6
Hydrogen Sulfide	18	9
Indene	12	6
Iron & Compounds, NOS	18	9
Isophorone	12	6
Isopropyl Ether	9	3
Kelthane	15	6
Kepone	18	9
Lead	18	9
Lindane	18	9
Magnesium & Compounds, NOS	15	6
Manganese & Compounds, NOS	18	9
Mercury	18	9
Mercury Chloride	18	9
Methoxychlor	15	6
4, 4-Methylene-Bis-(2-Chloroaniline)	18	9
Methylene Chloride	12	6
Methyl Ethyl Ketone	6	6
Methyl Isobutyl Ketone	12	6
4-Methyl-2-Nitroaniline	12	9
Methyl Parathion	9	9
2-Methylpyridine	12	6
Mirex	18	9

Table I (cont.)

Chemical/Compound	Ground Water and Surface Water Pathway Values	Air Pathway Values
Naphthalene	9	6
Nickel & Compounds, NOS	18	9
Nitric Acid	9	9
Nitroaniline, NOS	18	9
Nitrogen Compounds, NOS	12	0
Nitroguanidine	12	9
Nitrophenol, NOS	15	9
m-Nitrophenol	15	
o-Nitrophenol	12	
p-Nitrophenol	15	
Nitrosodiphenylamine	12	6
Parathion	9	9
Pentachlorophenol (PCP)	18	9
Pesticides, NOS	18	9
Phenanthrene	15	9
Phenol	12	9
Phosgene	9	9
Polybrominated Biphenyl (PBB), NOS	18	9
Polychlorinated Biphenyls (PCB), NOS	18	9
Potassium Chromate	18	9
Radium & Compounds, NOS	18	9
Radon & Compounds, NOS	15	9
RDX (Cyclonite)	15	
2, 4-D, Salts & Esters	18	9
Selenium	15	9
Sevin (Carbaryl)	18	9
Sodium Cyanide	12	9
Styrene	9	6
Sulfate	9	0
Sulfuric Acid	9	9
2, 4, 5-T	18	9
1, 1, 2, 2-Tetrachloroethane	18	9
Tetrachloroethane, NOS	18	9
1, 1, 2, 2-Tetrachloroethene	12	6

Table 1 (Cont.)

Chemical/Compound	Ground Water and Surface Water Pathway Values	Air Pathway Values
Tetraethyl Lead	18	9
Tetrahydrofuran	15	6
Thorium & Compounds, NOS	18	9
Toluene	9	6
TNT	12	
Toxaphene	18	9
Tribromomethane	18	9
1, 2, 4-Trichlorobenzene	15	6
1, 3, 5-Trichlorobenzene	15	6
1, 1, 1-Trichloroethane	12	6
1, 1, 2-Trichloroethane	15	6
Trichloroethane, NOS	15	6
Trichloroethene	12	6
1, 1, 1-Trichloropropane	12	6
1, 1, 2-Trichloropropane	12	6
1, 2, 2-Trichloropropane	12	6
1, 2, 3-Trichloropropane	15	9
Uranium & Compounds, NOS	18	9
Varsol	12	6
Vinyl Chloride	15	9
Xylene	9	6
Zinc & Compounds, NOS	18	9
Zinc Cyanide	18	9

REFERENCE NO. 8

ecology and environment, inc.
195 SUGG ROAD, P.O. BOX D, BUFFALO, NEW YORK 14225, TEL. 716-632-4491, TELEX 91-9183
International Specialists in the Environment

September 25, 1987

Mr. Dean Brown
Town of Niagara Water Department 7105 Lockport Road
Niagara Falls, New York 14305

Dear Mr. Brown:

Recently I spoke with you concerning the use of well water for drinking water in the Town of Niagara. At that time you stated that two families were presently using groundwater as a drinking source and that those wells are located near Witmer and Pennsylvania Roads. You also stated that no other residences in the Town of Niagara used groundwater for drinking purposes.

This information that you provided will be used in the preparation of a Inactive Hazardous Waste Site Phase I report for the New York State Department of Environmental Conservation (DEC). The DEC requires that all information contained in the report be fully documented, and we ask that you sign this document to acknowledge that you have provided us with this information and that it (with any corrections or qualifications you may note) is correct to the best of your knowledge.

I certify that I provided the above information to Ecology and Environment, Inc., and it is correct to the best of my knowledge.

______________________________ ______________
Signature Date

Thank you very much for your assistance in the preparations of this Phase I report.

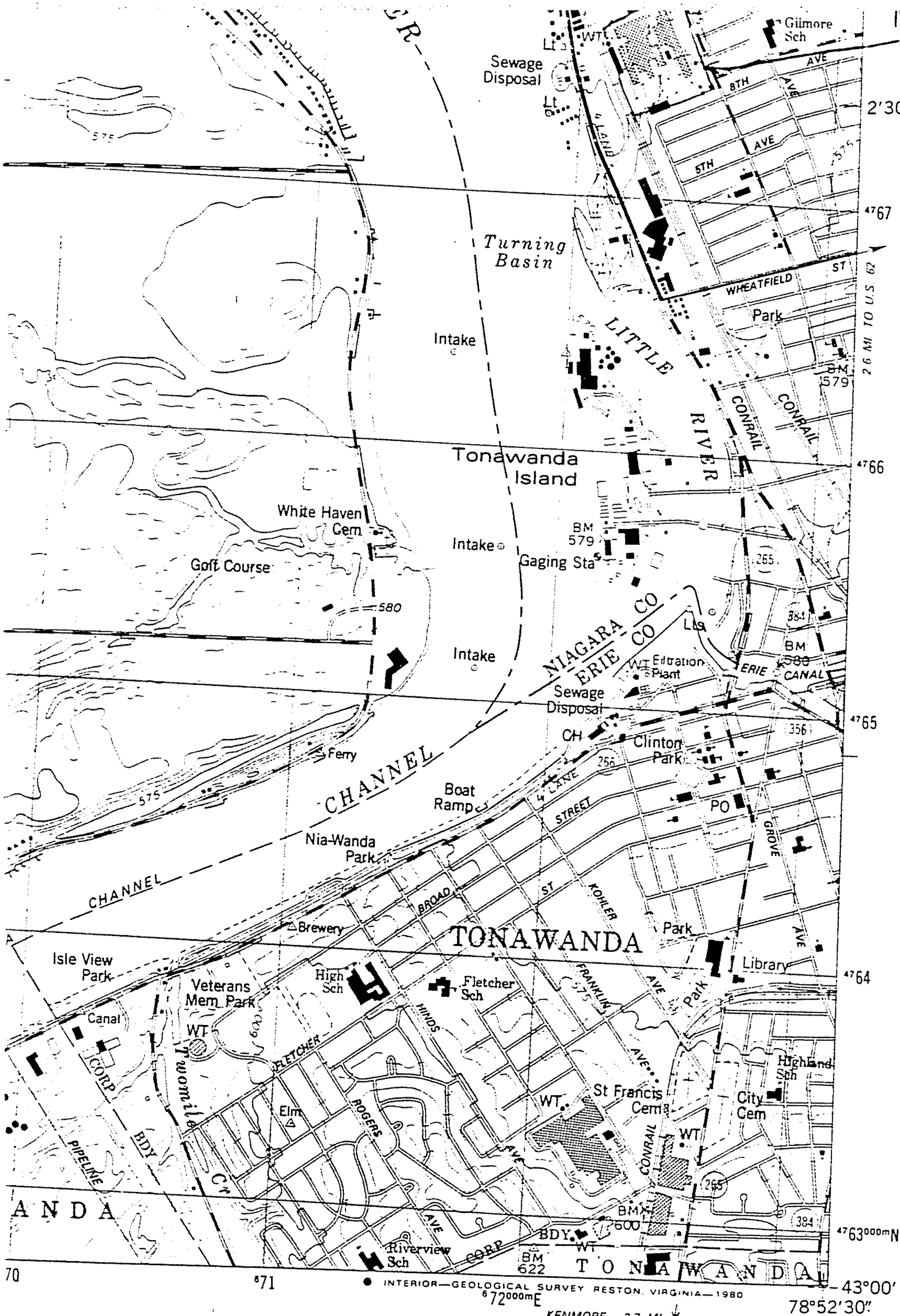
Sincerely,

Jon Sundquist

JS/wj

*Mr. Brown did not respond to request for certification.

REFERENCE NO. 9



Feet	Meters
1	3048
2	6096
3	9144
4	1.2192
5	1.5240
6	1.8288
7	2.1336
8	2.4384
9	2.7432
10	3.0480

To convert feet to meters multiply by 3048

To convert meters to feet multiply by 3.2808

ROAD CLASSIFICATION

Primary highway, hard surface

Light-duty road, hard or improved surface

Secondary highway, hard surface

Unimproved road

Interstate Route U. S. Route State Route

QUADRANGLE LOCATION

TONAWANDA WEST, N. Y.

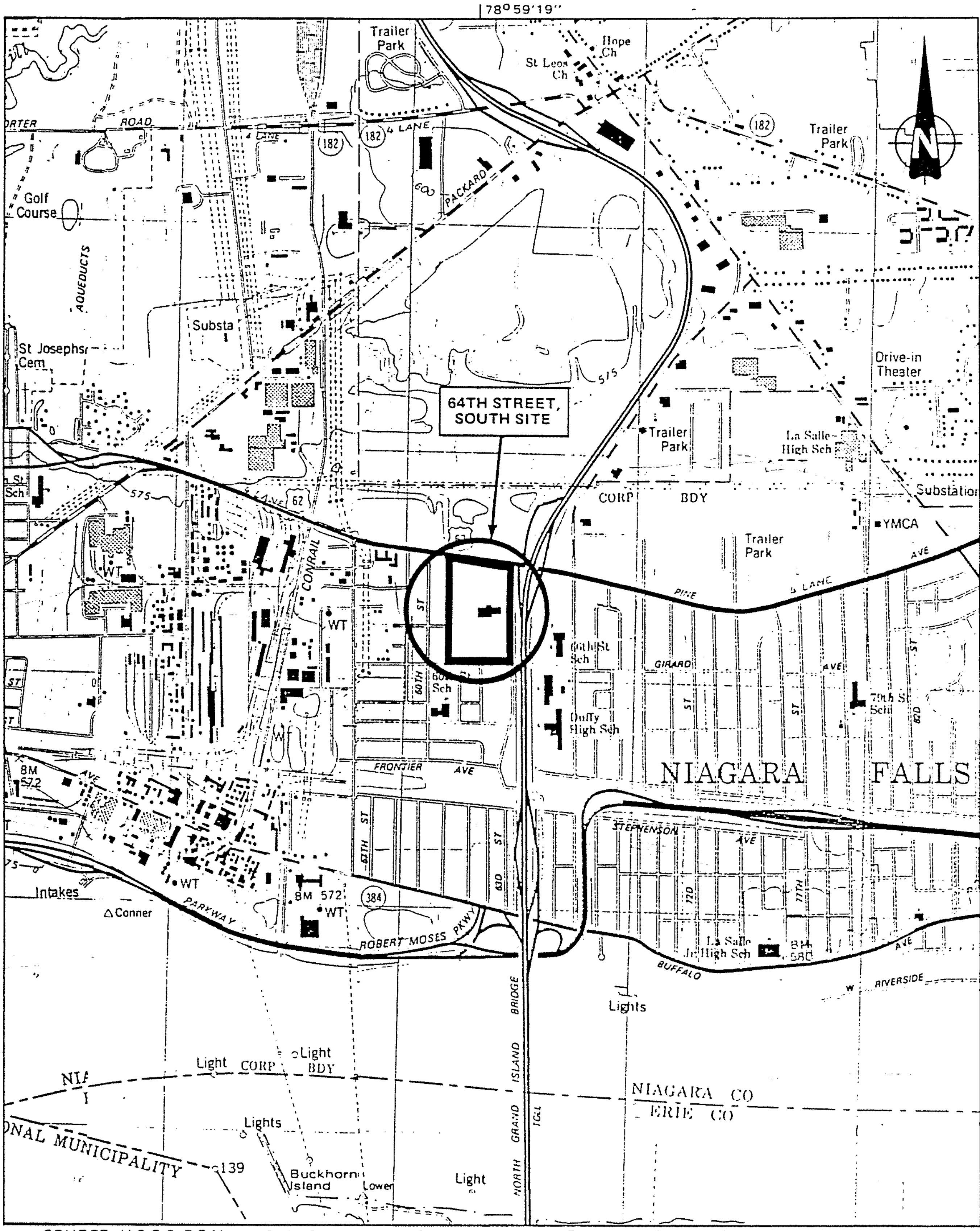
SW/4 TONAWANDA 15' QUADRANGLE

N4300—W7852.5/7.5

1980

5-146

DMA 5270 III SW—SERIES V821



SOURCE: U.S.G.S. 7.5 Minute Series (Topographic) Quadrangles, Niagara Falls, N.Y.–Ont., 1980; Tonawanda West, N.Y., 1980.

SCALE

0 ½ 1 MILE

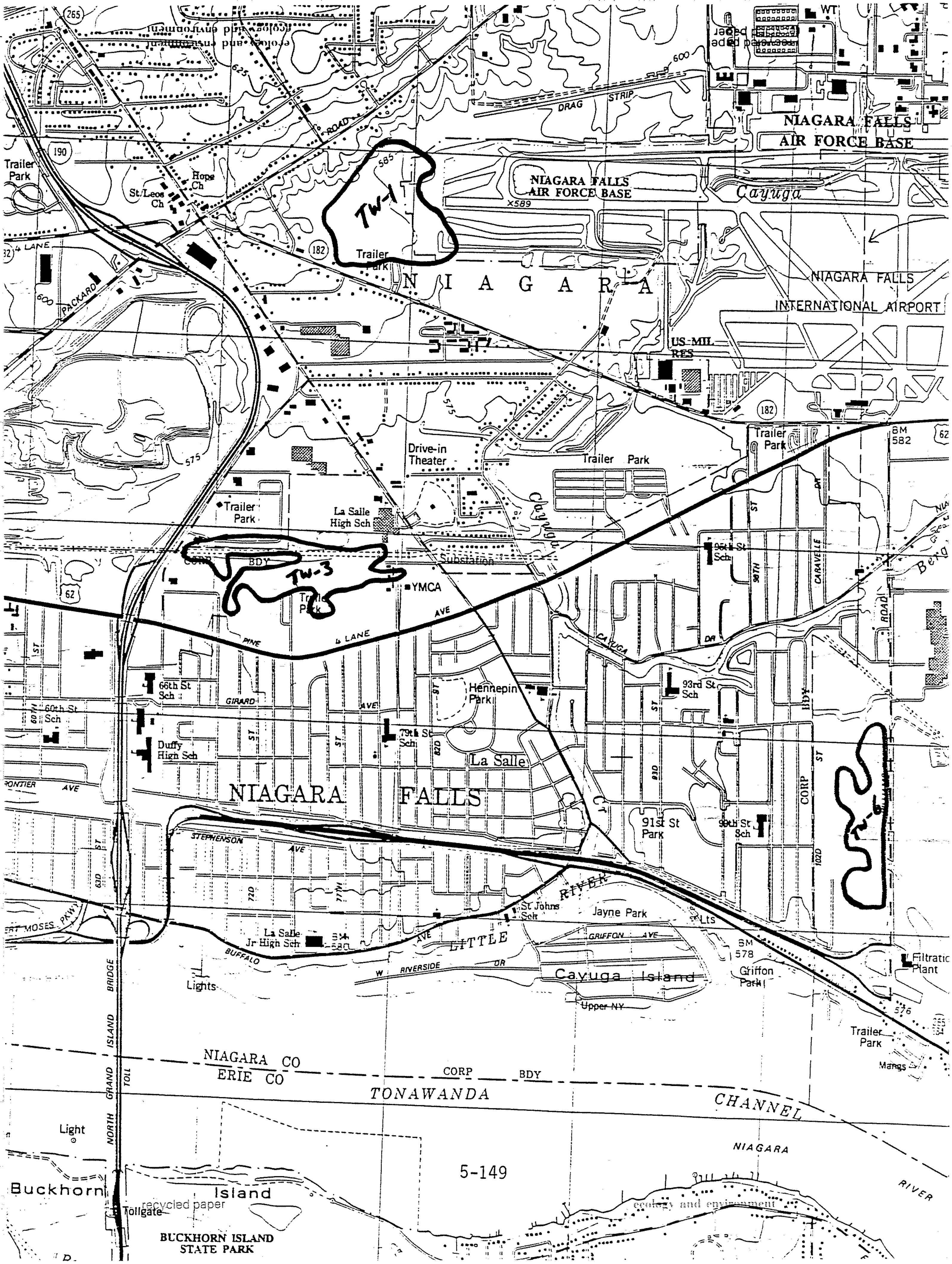
0 .5 1 KILOMETER

recycled paper

Figure 1–1 LOCATION MAP

ecology and environment

REFERENCE NO. 10


TW-1
TW-3
TW-6
NIAGARA FALLS AIR FORCE BASE
NIAGARA FALLS INTERNATIONAL AIRPORT
US MIL RES
DRAG STRIP
Cayuga
N I A G A R A
Trailer Park
Hope Ch
St Leos Ch
PACKARD
4 LANE
Drive-in Theater
La Salle High Sch
Substation
YMCA
CORP BDY
PINE AVE
95th St Sch
CAYUGA DR
66th St Sch
60th St Sch
GIRARD
Hennepin Park
93rd St Sch
79th St Sch
Duffy High Sch
La Salle
NIAGARA FALLS
FRONTIER AVE
STEPHENSON AVE
91st St Park
99th St Sch
LITTLE RIVER
St Johns Sch
Jayne Park
GRIFFON AVE
La Salle Jr High Sch
BUFFALO AVE
W RIVERSIDE DR
Cayuga Island
Griffon Park
Filtration Plant
Lights
Upper NY
Trailer Park
NIAGARA CO
ERIE CO
CORP BDY
TONAWANDA CHANNEL
NIAGARA RIVER
NORTH GRAND ISLAND BRIDGE
Light
Buckhorn Island
Tollgate
BUCKHORN ISLAND STATE PARK

Freshwater Wetlands Classification Sheet

December 5, 1984

Niagara County
Map 14 of 18
Tonawanda West Quadrangle

Wetlands Identification Code	Municipality	Classification
TW-1	Niagara Town	II
TW-3	Niagara Town, City of Niagara Falls	II
TW-4	Wheatfield, City of North Tonawanda	II
TW-6	Wheatfield	II
TW-24	Wheatfield	II
TW-25	Wheatfield, City of North Tonawanda	II
TW-26	Wheatfield	II
TE-1 (formerly TE, TW-1)	Wheatfield	II
TE-15 (formerly TE, TW-15)	City of North Tonawanda	II

REFERENCE NO. 11

CONTACT REPORT

AGENCY : New York State Department of Environmental Conservation, Region 9

ADDRESS : 600 Delaware Ave., Buffalo, NY 14202

PHONE : (716)847-4550

PERSON CONTACTED : James Snider, Senior Wildlife Biologist

TO : Jon Sundquist

DATE : June 2, 1987

SUBJECT : Critical Wildlife habitats near potential hazardous waste sites in Niagara County

In preparation of Phase 1 reports on potential hazardous waste sites in New York for the NYSDEC, information about nearby critical wildlife habitats is necessary. The following information is provided by Mr. James Snider of the Bureau of Wildlife, NYSDEC Region 9.

Except for the seasonal appearance of migratory birds, including, possibly the bald eagle, there are no critical habitats of endangered species within 2 miles of the suspected waste sites listed below:

- SKW Alloys
  Witmer Road at Maryland Ave.
  Niagara Falls, NY
- Dussault Foundries
  2 Washburn Street
  Lockport, NY
- North Love Canal
  Near Cleghorn Drive
  Lewiston, NY
- Carborundum Building 82
  Buffalo Ave.
  Niagara Falls, NY
- Ross Steel Company
  4237 Pine Ave.
  Niagara Falls, NY
- Frontier Bronze
  4870 Packard Rd.
  Niagara Falls, NY
- Roblin Steel
  101 East Ave.
  N. Tonawanda, NY

- LaSalle Expressway
  Niagara Falls, NY
- Diamond Shamrock
  Ohio Ave.
  Lockport, NY
- Town of Lockport Landfill
  Canal Road
  Lockport, NY
- Power Authority Road
  Lewiston, NY
- 64th Street South
  Chevy Place
  Niagara Falls, NY
- Walmore Road
  Walmore Rd., 0.5 miles south of Lockport Road
  Wheatfield, NY

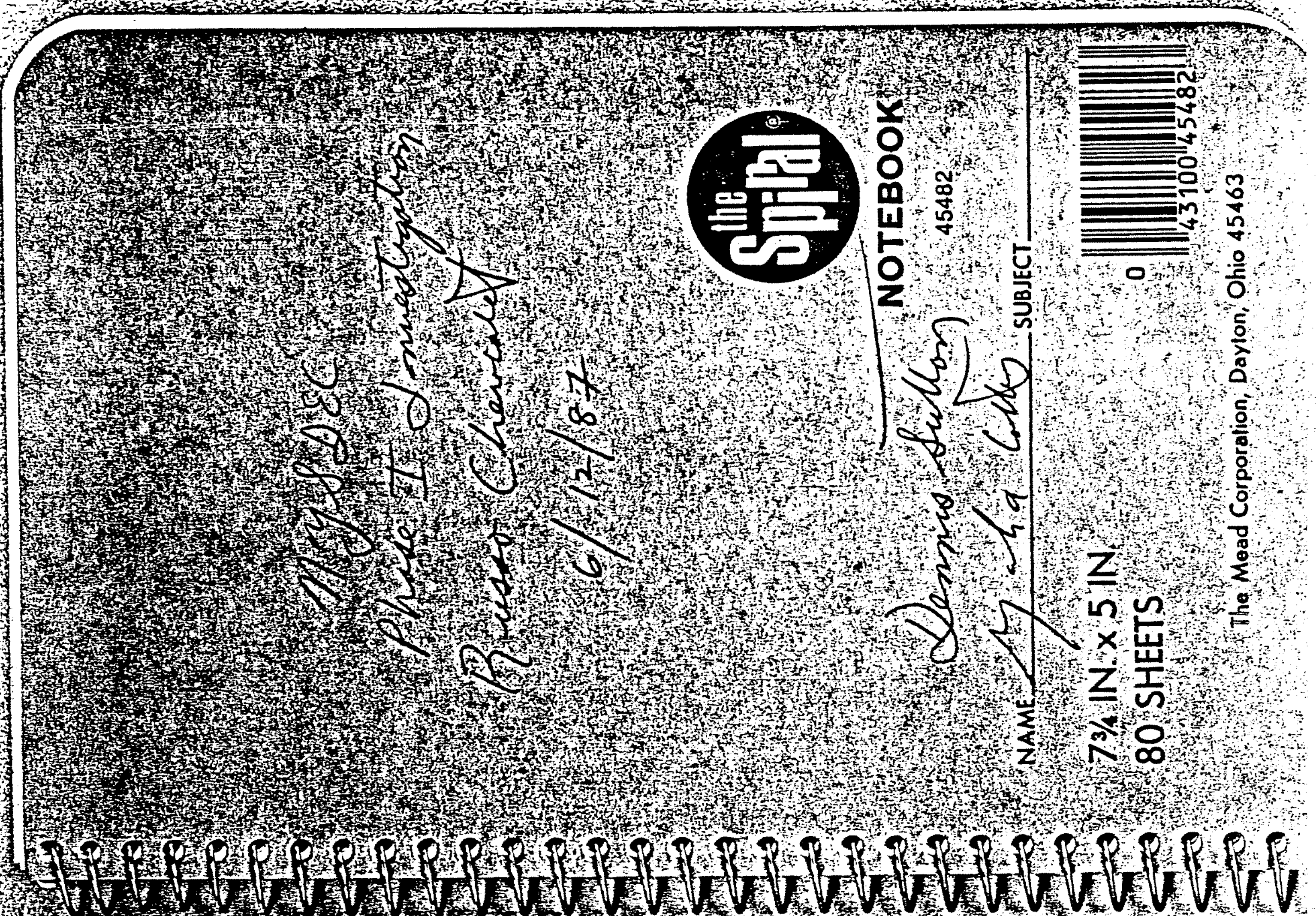
James R. [signature]
Signature

July 27, 1987
Date

recycled paper

ecology and environment

REFERENCE NO. 12


6/12/87
the Spiral
NOTEBOOK
45482
NAME
SUBJECT
7¾ IN. x 5 IN.
80 SHEETS
0 43100 45482
The Mead Corporation, Dayton, Ohio 45463

64th Street South

Russo Chevrolet

6/12/87

Overcast, 60's, humid
winds -10-15 mph

Team Members:

Mark Lottey — Site Safety
Dennis Sutton — Coordinator

Others Present:
Paul Dickey - NCHD

① Ownership data

② loc. of source

1200 – arrived at site
for meeting.

People present at meeting

Barnum Bailey circus was
here yearly prior to
Russo Chevrolet –

– Met Joseph Russo Sr.
He said ~~[illegible]~~ that he
knows nothing about this
site except that it was
used as a circus site.

For Sale sign – 9 acres
283-7622

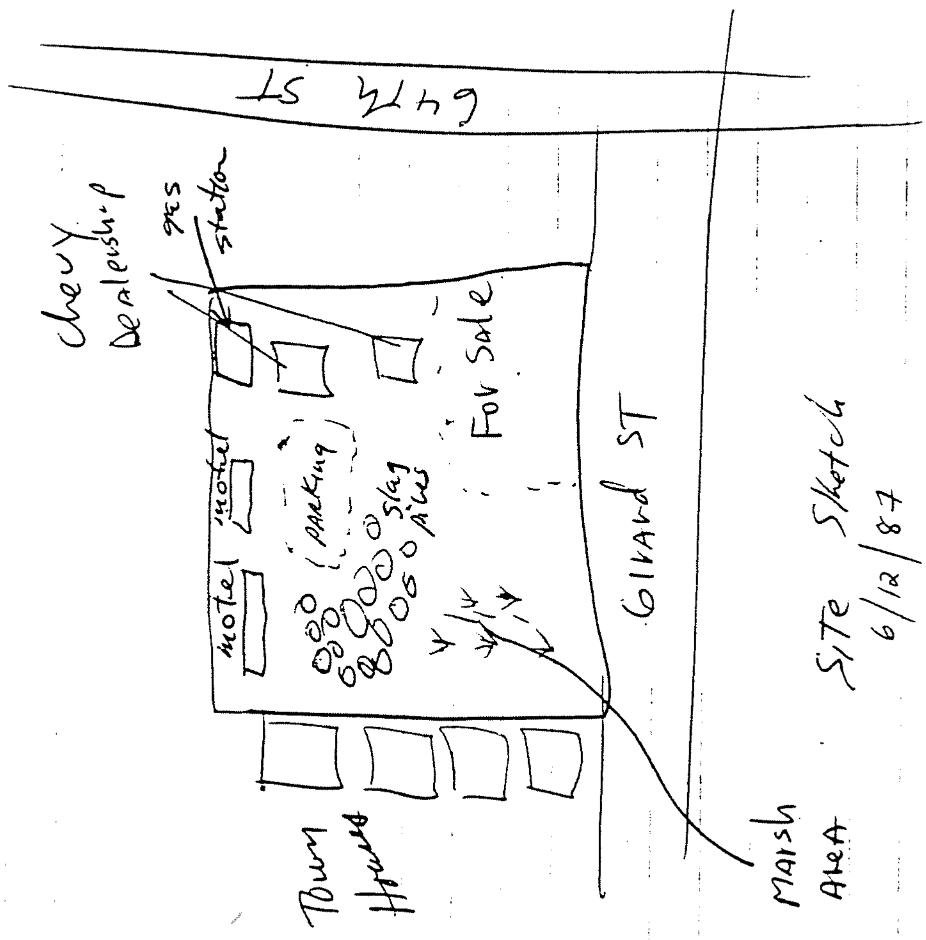

64th ST
Chevy Dealership
gas station
For Sale
motel
motel
parking
slag piles
Girard ST
Town Houses
Marsh Area
Site Sketch
6/12/87

photo 10 - view of 64 St
South from Gerard St
looking North (1212)

This site is on open
grassland ~ marsh area on
west edge

photo 11 - slag noted in vehicle trail

Noted ~~stage~~ slag piles in ~~south~~ south
west corner of site, overgrown with
vegetation

photo 12 - 12 20 pm slag pile

photo 13 slag + foundry dust

entire area covered with
slag piles in rear of Chevy
dealership

12[25] concrete waste noted
near slag piles

1230 Rock and wood debris
piles noted in NW corner
near Chev dealer parking lot

Area is completely overgrown with
vegetation except for what
appears to be vehicle or
foot bicycle trails

no readings on HNu

minor trash (Household)
noted. paper, metal

1240 leave site to proceed
to EPA office in Niagara Falls
to speak with John Anderson
with regards to this site

REFERENCE NO. 13

GSC-TR8705

DRAFT

GRAPHICAL EXPOSURE MODELING SYSTEM

(GEMS)

USER'S GUIDE

VOLUME 1. CORE MANUAL

Prepared for:

U.S. ENVIRONMENTAL PROTECTION AGENCY
OFFICE OF PESTICIDES AND TOXIC SUBSTANCES
EXPOSURE EVALUATION DIVISION
Task No. 3-2
Contract No. 68023970
Project Officer: Russell Kinerson
Task Manager: Loren Hall

Prepared by:

GENERAL SCIENCES CORPORATION
6100 Chevy Chase Drive, Suite 200
Laurel, Maryland 20707

Submitted: February, 1987

POPULATION

(1 mile : 1.67 km) (2 mile : 3.33 km) (3 mile : 5 km)

SITE	Pop.	# houses	Pop.	# houses	Pop.	# houses
FORMSO	3024	1190	0	0	2836	1737
MOENCH	0	0	1369	629	3973	1316
TERWILLIGER	25	10	1583	716	0	0
NORMAN RODGERS	220	50	3014	1133	2022	845
CAMP ARROWHEAD	228	98	1295	523	1999	979
BOEHMER PROPERTY	1174	707	640	234	977	398
MACHIAS LANDFILL	1174	707	640	234	977	398
ROUTE 242 SITE	126	50	1688	891	0	0
MICHAEL WOLFER	1371	495	1236	501	2429	982
VALMORE ROAD	0	0	2632	981	23581	8512
64 ST SOUTH	2327	766	26954	10209	43007	17674
TOWN OF LOCKPORT	2154	672	7526	2979	14761	5807
LASALLE EXPRESSWAY	11100	4229	16372	6092	10665	4016
ROBLIN STEEL	11680	4425	22023	8501	34155	12307
CARBORUNDUM	18758	8661	21039	9049	18866	6945
CARBORUNDUM GLOBAR	8790	3380	32103	12431	18061	7993
STAUFFER CHEMICAL	1273	405	5054	1839	8346	2254
FRONTIER BRONZE	2351	893	38415	15158	41041	17067
...SSAULT FOUNDRY	16231	6856	12699	4525	7114	2367
...KH ALLOYS	5540	2157	28495	10667	24264	10503
...SB WAREHOUSE	16854	4247	22107	8548	34464	12119
...EPUBLIC STEEL	16378	6180	45439	17271	43336	16953
...LD. HOPKINS LANDFILL	14719	5507	49981	19153	41841	16444
... VIEW TERRACE	11261	3575	19409	5983	37186	12641
...ERN METAL	21942	11711	62578	31979	105668	45345
...MC CORP	782	318	17331	6696	44012	17829

* POPULATION IS NOT C...
ie. BOEHMER PROPERTY
0–1 mile = 1174
1–2 mile = 640
2–3 mile = 977

HAVE TO SUM FOR TOT...
WITHIN ENTIRE RING
INCREASES OUTWARD

POPULATION

SITE	1 mile Pop.	# houses	2 mile Pop.	# houses	3 mile Pop.	# houses
SCHREIBER	1994	597	2919	913	3558	1333
...UNKIST	1151	346	4731	1532	6046	2012
...NYDER TANK	2978	1079	13524	4755	25942	9798
...DEN SANITATION	0	0	5679	1948	3909	1350
...MES FOX	2292	854	1369	555	4763	2010
...T - HOPKINS LANDFILL	18596	6674	48674	18217	53208	23583
...MOND SHAMROCK	8308	3454	21526	7747	3668	1191
...SS STEEL	10995	4320	36207	14154	28361	10375

recycled paper

REFERENCE NO. 14

CONTACT REPORT

Telephone

AGENCY: Niagara County Water Department

ADDRESS:

TELEPHONE: 434-8835

PERSON CONTACTED: Jon Burmaster

TO: J. Sundquist

FROM: D. Sutton

DATE: 7/24/87

SUBJECT: Niagara County Water Intakes

xc:

Mr. Burmaster stated that:

The Niagara County water intake is between Buckhorn Island State Park and Navy Island. This intake draws primarily from the Chippawa Channel of the Niagara River.

The City of Niagara Falls has two intakes:

1. The east branch of the Niagara River, this is the larger of the two, but was shut down by the NYS department of Health due to contammination.

2. Between Navy Island and Buckhorn Island State Park, this intake draws from the west (Chippawa) channel of the Niagara River.

bg

REFERENCE NO. 15

Draft

The National Register of Historic Places

1976

5-169

: Lewishon to carry forward their work in orama and dance with local children. *Multiple public/private:* NHL.

NIAGARA COUNTY

Lewiston. FRONTIER HOUSE, 460 Center St., 1824–1826. Stone, 3 1/2 stories, rectangular; gabled roof with stepped gables, paired chimneys, and balustrade; off-center and center entrances, full-width front porch with hipped roof, regular fenestration, oval windows in gables; N kitchen wings. Federal elements. Built as a tavern for Joshua Fairbanks and Benjamin and Samuel Barton, local prominent businessmen. *Private.*

Lewiston. LEWISTON MOUND, Lewiston State Park, Hopewellian affinities (c. 160). Oval burial mound. Partially investigated. *County.*

Lewiston vicinity. LEWISTON PORTAGE LANDING SITE, Prehistoric–19th C.. Gently sloping ravine leading from river remains of path used by travelers to avoid Niagara Falls. Archeological explorations yielded artifacts from Indian to British occupation, indicating this was a heavily used access point to a vital overland route. *State.*

Lockport. LOWERTOWN HISTORIC DISTRICT, Roughly bounded by Erie Canal and New York Central RR., 19th–20th C.. Primari- esidential district, with some religious and mercial buildings and warehouses; facing the canal are 2 1/2-story brick and stone residences with Greek Revival and Italianate elements built in the 1830's; off the canal are 1–2-story frame structures with additions and modern siding built mid-19th C. and some stone structures: notable are the Gothic Revival former Christ Episcopal Church (1854) and the Italianate Vine Street School (1864). Systematic development of the village began after canal opened; district was Lockport's social, commercial, and industrial center, 1830's–1860's. *Multiple public/private:* HABS.

Lockport. MOORE, BENJAMIN C., MILL (LOCKPORT CITY HALL; HOLLY WATER WORKS) , Pine St. on the Erie Canal, 1864. Coursed rubble, 2 1/2 stories over basement on sloping site, trapezoidal shape, hipped roof sections with cross gables, interior chimney; front center entrance with transom and pediment on pilasters, triple round arched windows in gables, rock-faced stone lintels and sills, ashlar quoins; interior altered; rear 2-story addition 1893. Built as a flour mill, converted c. 1885 to a water pumping plant; adapted as city hall 1893; one of few survivors of 25 industrial buildings once clustered along this section of Erie Canal. *Municipal.*

Niagara Falls. DEVEAUX SCHOOL COMPLEX, 2900 Lewiston Rd., 1855–1888. Educational complex; contains 3 connected struc- -es–Van Rensselaer Hall (1855–1857), Pat- on Hall (1866), and Munro Hall (1888); ..d outbuildings–barn, shed, and gymnasium. Gothic Revival elements. Founded by Judge Samuel DeVeaux as an Episcopal school for poor and orphaned boys; later became a prominent preparatory school; closed, 1971. *Private.*

Niagara Falls. NIAGARA FALLS PUBLIC LIBRARY, 1022 Main St., 1902–1904, E. E. Joralemon, architect. Stone, yellow brick; 1 story, rectangular with semielliptical rear bow, flat roof with parapet, slightly projecting center entrance bay with pedimented double doorway, pedimented windows, string courses; fine interior detail intact. Neo-Classical Revival elements. One of many public libraries endowed by Andrew Carnegie. *Public.*

Niagara Falls. NIAGARA RÈSERVATION, 1885. Includes the falls, Goat Island and other islets, paths, and an observation tower. In establishing a reservation of over 400 acres, New York became the first state to use eminent domain powers to acquire land for aesthetic purposes. *State:* NHL.

Niagara Falls. SHREDDED WHEAT OFFICE BUILDING, 430 Buffalo Ave., 1900. Steel frame, brick; 5 stories, rectangular, flat roof, center entrance, 5 paired window bays, segmental arched basement windows, wide parapet; interior featured 4th-floor auditorium and 5th-floor cafeteria; doubled glazed windows. Commercial style. Administrative office building of original Shredded Wheat factory complex, developed by Henry D. Perky. *Private.*

Niagara Falls. U.S. CUSTOMHOUSE, 2245 Whirlpool St., 1863. Stone, 2 1/2 stories, square, hipped roof, arched window and door openings on W facade; built into railroad embankment, S side opens onto railroad tracks; renovated, 1928. Continues to serve as customs office for trains from Canada. *Private:* HABS.

Niagara Falls. WHITNEY MANSION, 335 Buffalo Ave., 1849–1851. Limestone, 2 1/2 stories, L-shaped, intersecting gabled roof sections; original section has off-center entrance with full-width Ionic portico; 19th C. side addition has front bay window and gabled dormer with 3 round arched windows. Greek Revival. Built according to 1830's design by Solon Whitney, son of Gen. Parkhurst Whitney, village founder and prominent hotel and tavern owner. *Private.*

Youngstown vicinity. OLD FORT NIAGARA, N of Youngstown on NY 18, 1678. Complex of stone buildings bounded by stone walls, earthworks, and a moat; restored Original fort built in 1678; altered 1725–1726 and 1750–1759. Held alternately by French, British, and Americans in struggle for control of continent; strategically located in commanding the Great Lakes from Lake Erie to Ontario and in covering approaches to western NY. *State:* NHL.

ONEIDA COUNTY

Boonville. ERWIN LIBRARY AND PRATT HOUSE, 104 and 106 Schuyler St., 1890, C. L. Vivian (Erwin Library); 1875, J. B. Lathrop (Pratt House). Erwin Library: limestone, 1 story, gabled and hipped roofs; square tower with pyramidal roof contains recessed arched entrance. Romanesque. Pratt House: brick, 3 stories, mansard roof with dormers and central tower crowned with iron cresting and spire, ornate bracketed cornices and metal lintels; original interior wall coverings, fixtures, and woodwork. Second Empire. *Private.*

Boonville. FIVE LOCK COMBINE AND LOCKS 37 AND 38, BLACK RIVER CANAL (BOONVILLE GORGE PARK) , NY 46, 19th–20th C.. Section of the abandoned Black River Canal (built mid-19th C.) running through rugged terrain of Boonville Gorge; contains locks 37 and 38 and a 5-lock combine (locks 39–43); canal was 42' deep; locks, 90' by 15', which accommodate 70-ton boats, were built 1895–early 1900's. Canal built to connect Black River Valley to Erie Canal provided water supply for Erie Canal, allowed expansion of valley's lumbering industry, and fostered growth of towns. *State/county:* HAER.

Clinton. HAMILTON COLLEGE CHAPEL, Hamilton College campus, 1827, Philip Hooker, architect. Coursed rubble, 3 stories, rectangular, low pitched roof, interior chimney, modillion cornice, front and rear parapet; front slightly projecting 4-story clock tower with 3-stage frame belfry -2 stories, each with columns and entablature, surmounted by octagonal cupola; front center double-door entrance with round arched window above, flanked by tall round arched windows, blind decorative frame panels; limestone ashlar quoins, lintels, and sills; side elevations with 3 tiers of windows; apse added 1897; interior altered. Federal. Multipurpose classroom and chapel building designed by Philip Hooker; unusual 3-story interior plan attributed to John H. Lothrop, a trustee. *Private.*

Clinton. ROOT, ELIHU, HOUSE, 101 College Hill Rd., 1817. Frame, clapboarding; 2 stories, irregular shape, gabled roof, interior chimneys, pedimented arched portico, off-center entrance with semielliptical fanlight and side lights, 2-story pilasters dividing bays in flush-sided main facade, pedimented rear porch; side additions; restored, 1900's. Federal. Home of Elihu Root, U.S. Secretary of War largely credited with conceptual foundation for 20th C. development of American Army, Secretary of State, U.S. senator, and winner of 1912 Nobel Peace Prize. *Private; not accessible to the public:* NHL.

Rome. ARSENAL HOUSE, 514 W. Dominick St., c. 1813–1814. Brick, 2 1/2 stories, rectangular, gabled roof, pairs of bridged interior end chimneys above single gable steps, central pedimented gable with elliptical window, 2 vertical elliptical windows in gabled ends between chimneys, stone sills and lintels; later front porch with large modillion blocks, chamfered

REFERENCE NO. 16

ecology and environment, inc.
195 SUGG ROAD, P.O. BOX D, BUFFALO, NEW YORK 14225, TEL. 716-632-4491, TELEX 91-9183
International Specialists in the Environment

October 2, 1987

Mr. Michael Hopkins
Niagara County Department
of Health
10th and East Falls Street
Niagara Falls, New York 14302

Dear Mr. Hopkins:

On several occasions during the course of the Phase 1 investigations, E & E has contacted the Niagara County Department of Health to obtain information in regard to various characteristics of the sites under investigation. The DEC requires that all information contained in Phase 1 reports be fully documented. We ask you to review the information your department has provided, as presented in this letter, and sign this document to acknowledge that you have provided this information and that it (with any corrections or qualifications) is correct to the best of your knowledge.

Ross Steel

1) No hazardous waste is expected to be on site.
2) Groundwater is not used for irrigation within a 3-mile radius of the site.
3) Surface water within 3 miles of this site is used for commercial, industrial, and recreational purposes.
4) The drinking water intakes are upstream of site.

Dussault Foundry

1) There is no use of groundwater within 3 miles of site.
2) The surface water within 3 miles downstream of site is used for recreation (Erie Canal). (* 1)

Town of Lockport Landfill

1) There is no use of groundwater within 3 miles of site.
2) The Erie Canal (surface water) is used for recreation near this site. (* 1)
3) The drinking water intakes are located in the Niagara River located upstream of this site. * 2

SKW Landfill

1) The drinking water surface intakes are located upstream of this site.
2) Groundwater is used within a 3 mile radius of this site for drinking water. * 3
3) The surface water downstream (Niagara River) is used for recreation (Maid of Mist, fishing).

Diamond Shamrock

1) There is no groundwater used within a 3 mile radius of this site.

Roblin Street

1) There is no use of groundwater within a 3 mile radius of this site, drinking or irrigation.

Electro Minerals U. S. (formerly Carborundum Bldg. 82)

1) The water supply intakes are located upstream of this site.

Frontier Bronze

1) There is no suspected hazardous waste disposal present at this site.
2) Groundwater for drinking purposes is used by a neighborhood approximately 2.5 miles to the NW, at the intersection of Pennsylvania and Witmer Road. Two families, roughly 8 people, use groundwater for drinking purposes. *

Walmore Road

1) The well on site is used for irrigation. * 5
2) Approximately 1 acre of area is irrigated by this groundwater well.
3) There is no use of surface water 3 miles downstream of this site.

New York Power Authority Road Site

1) Hazardous waste is not suspected to be disposed of on site.
2) There is no land irrigated with groundwater within 3 miles of site.

I would also like you to confirm the fact that no fire official has declared any of the following sites a fire or explosion hazard: * 6

- SKW Alloys Landfill - Witmer Road, Town of Niagara.
- Dussault Foundry - Washburn Street, Lockport.
- Frontier Bronze - New Road, City of Niagara Falls.
- Staufer Chemical, North Love Canal - Town of Lewiston.

- o Electro Minerals, U.S., Inc., (formerly Carobrundum Bldg. #82), Buffalo Avenue, City of Niagara Falls.
- o Ross Steel Co. - Pine Avenue, Niagara Falls (now the site of the New York Power Authority water intake conduit right-of-way).
- o Roblin Steel Company - Oliver Street, North Tonawanda.
- o LaSalle Expressway - specifically near Love Canal.
- o Diamond Shamrock, now Occidental Petroleum Corp., Ohio Street, Lockport, New York.
- o Town of Lockport Landfill - East Canal Street, Lockport, New York.
- o Power Authority Road Site - New Road, Lewiston, New York (across from Hyde Park Landfill).
- o 64 Street South (owned by Russo Chevrolet) - 64th and Niagara Falls Blvd., Niagara Falls.
- o Walmore Road, 6373 Walmore Road, Town of Wheatfield, New York.

I certify that I provided the above information to Ecology and Environment, Inc., and It is correct to the best of my knowledge.
Subject to footnotes & comments provided

Signature: [signature] Date: 10/7/87

Please find maps enclosed to assist you in locating these sites. If you have any questions regarding the above, please contact me at 633-9881.

Thank you very much for your time and assistance in our ongoing investigations

Sincerely,

Dennis Sutton

oio

EPA 2070-13

5.5

EPA

POTENTIAL HAZARDOUS WASTE SITE SITE INSPECTION REPORT

PART 1 - SITE LOCATION AND INSPECTION INFORMATION

I. IDENTIFICATION	
01 State NY	02 Site Number 932085B

II. SITE NAME AND LOCATION

01 Site Name (Legal, common, or descriptive name of site)	02 Street, Route No., or Specific Location Identifier
64th Street South	Pine Ave., Girard Ave., 62nd St., Chevy Place

03 City	04 State	05 Zip Code	06 County	07 County Code	08 Cong. Dist.
Niagara Falls	NY	14304	Niagara	063	NYBb

09 Coordinates Latitude	Longitude	10 Type of Ownership (Check one)
43° 05' 46.4"	78° 59' 19.1"	[X] A. Private [ ] B. Federal ______ [ ] C. State [ ] D. County [ ] E. Municipal [ ] F. Other ______ [ ] G. Unknown

III. INSPECTION INFORMATION

01 Date of Inspection	02 Site Status	03 Years of Operation
6 / 12 / 87 (Month Day Year)	[ ] Active [X] Inactive	1950 (Beginning Year) – Early 1960's (Ending Year) [X] Unknown

04 Agency Performing Inspection (Check all that apply)

[ ] A. EPA [ ] B. EPA Contractor ______ (Name of Firm) [ ] C. Municipal [ ] D. Municipal Contractor ______ (Name of Firm)

[ ] E. State [X] F. State Contractor Ecol. & Envir. (Name of Firm) [ ] G. Other ______ (Specify)

05 Chief Inspector	06 Title	07 Organization	08 Telephone No.
Dennis Sutton	Geologist	E & E	(716) 684-8060
09 Other Inspectors	**10 Title**	**11 Organization**	**12 Telephone No.**
Mark Cotter	Environmental Scientist	E & E	(716) 684-8060
			( )
			( )
			( )
			( )

13 Site Representatives Interviewed	14 Title	15 Address	16 Telephone No.
None			( )
			( )
			( )
			( )
			( )

17 Access Gained By (Check one)	18 Time of Inspection	19 Weather Conditions
[X] Permission [ ] Warrant	12:00	Overcast, 60's, humid, winds 10-15 mph

IV. INFORMATION AVAILABLE FROM

01 Contact	02 Of (Agency/Organization)	03 Telephone No.
Walter E. Demick	NYSDEC	(513) 457-9538

04 Person Responsible for Site Inspection Form	05 Agency	06 Organization	07 Telephone No.	08 Date
M. Farrell	NA	E & E	(716) 684-8060	6 / 20 / 87 (Month Day Year)

EPA Form 2070-13 (7-81) D1628

POTENTIAL HAZARDOUS WASTE SITE
SITE INSPECTION REPORT

PART 2 - WASTE INFORMATION

I. IDENTIFICATION	
01 State NY	02 Site Number 932085B

II. WASTE STATES, QUANTITIES, AND CHARACTERISTICS

01 Physical States (Check all that apply)

[X] A. Solid
[ ] B. Powder, Fines
[ ] C. Sludge
[ ] D. Other ________ (Specify)
[ ] E. Slurry
[ ] F. Liquid
[ ] G. Gas

02 Waste Quantity at Site (Measure of waste quantities must be independent)

Tons 0.04
Cubic Yards ________
No. of Drums ________

03 Waste Characteristics (Check all that apply)

[ ] A. Toxic
[ ] B. Corrosive
[ ] C. Radioactive
[ ] D. Persistent
[ ] E. Soluble
[ ] F. Infectious
[ ] G. Flammable
[ ] H. Ignitable
[ ] I. Highly volatile
[ ] J. Explosive
[ ] K. Reactive
[ ] L. Incompatible
[X] M. Not applicable

III. WASTE TYPE

Category	Substance Name	01 Gross Amount	02 Unit of Measure	03 Comments
SLU	Sludge			
OLW	Oily waste			
SOL	Solvents			
PSD	Pesticides			
OCC	Other organic chemicals			
IOC	Inorganic chemicals	40,000	yd^3	Estimate of waste disposal amount
ACD	Acids			
BAS	Bases			
MES	Heavy Metals			

IV. HAZARDOUS SUBSTANCES (See Appendix for most frequently cited CAS Numbers)

01 Category	02 Substance Name	03 CAS Number	04 Storage/Disposal Method	05 Concentration	06 Measure of Concentration
OLW	Phenanthrene	85-01-8	N.A.	Approx. 1	ppm
OLW	Fluoranthene	206-44-0	N.A.	Approx. 1	ppm
OLW	Pyrene	129-00-0	N.A.	Approx. 1	ppm
OLW	Benzo(b)anthracene	56-55-3	N.A.	Approx. 1	ppm
OLW	Chrysene	218-01-4	N.A.	Approx. 1	ppm
OLW	Benzo(b)fluoranthene	205-99-2	N.A.	Approx. 1	ppm
OLW	Benzo(k)fluoranthene	207-08-9	N.A.	Approx. 1	ppm
OLW	Benzo(a)pyrene	50-32-8	N.A.	Approx. 1	ppm
OLW	Indeno(1,2,3-cd)pyrene	193-39-5	N.A.	Approx. 1	ppm
OLW	Benzo(ghi)perylene	191-24-2	N.A.	Approx. 1	ppm
OLW	Dibenzo(a,h)anthracene	53-70-3	N.A.	Approx. 1	ppm
OLW	Bis(2-Ethylhexyl) phthalate	117-81-7	N.A.	Approx. 1	ppm

V. FEEDSTOCKS (See Appendix for CAS Numbers)

Category	01 Feedstock Name	02 CAS Number	Category	01 Feedstock Name	02 CAS Number

VI. SOURCES OF INFORMATION (Cite specific references, e.g., state files, sample analysis, reports)

1. Site inspection
2. Myers, Neil, NUS Corporation, Sept. 5, 1985, letter to Diana Messina, USEPA, Region II

D162_

POTENTIAL HAZARDOUS WASTE SITE SITE INSPECTION REPORT PART 3 - DESCRIPTION OF HAZARDOUS CONDITIONS AND INCIDENTS	I. IDENTIFICATION	
	01 State NY	02 Site Number 932085B

II. HAZARDOUS CONDITIONS AND INCIDENTS

01 [ ] A. Groundwater Contamination — 02 [ ] Observed (Date ______) [ ] Potential [ ] Alleged
03 Population Potentially Affected ______ — 04 Narrative Description:

None reported.

01 [ ] B. Surface Water Contamination — 02 [ ] Observed (Date ______) [ ] Potential [ ] Alleged
03 Population Potentially Affected ______ — 04 Narrative Description:

No potential exists and none reported..

01 [X] C. Contamination of Air — 02 [X] Observed (Date 0/11/85) [ ] Potential [ ] Alleged
03 Population Potentially Affected ______ — 04 Narrative Description:

NUS FIT detected organic vapor releases during augering operations.

01 [ ] D. Fire/Explosive Conditions — 02 [ ] Observed (Date ______) [ ] Potential [ ] Alleged
03 Population Potentially Affected ______ — 04 Narrative Description:

No potential exists and none reported.

01 [X] E. Direct Contact — 02 [ ] Observed (Date ______) [X] Potential [ ] Alleged
03 Population Potentially Affected ______ — 04 Narrative Description:

Site is open field, unfenced
Unknown how many people may have walked on site.

01 [X] F. Contamination of Soil — 02 [ ] Observed (Date ______) [X] Potential [ ] Alleged
03 Area Potentially Affected 10 acres (Acres) — 04 Narrative Description:

Wastes are dumped directly on the ground.

01 [ ] G. Drinking Water Contamination — 02 [ ] Observed (Date ______) [ ] Potential [ ] Alleged
03 Population Potentially Affected ______ — 04 Narrative Description:

No potential exists and none reported.

01 [ ] H. Worker Exposure/Injury — 02 [ ] Observed (Date ______) [ ] Potential [ ] Alleged
03 Workers Potentially Affected ______ — 04 Narrative Description:

No potential exists and none reported.

01 [X] I. Population Exposure/Injury — 02 [ ] Observed (Date ______) [X] Potential [ ] Alleged
03 Population Potentially Affected ______ — 04 Narrative Description:

Site is open field, unfenced.

POTENTIAL HAZARDOUS WASTE SITE
SITE INSPECTION REPORT

PART 3 - DESCRIPTION OF HAZARDOUS CONDITIONS AND INCIDENTS

I. IDENTIFICATION

01 State	02 Site Number
NY	932085B

II. HAZARDOUS CONDITIONS AND INCIDENTS (Cont.)

01 [ ] J. Damage to Flora 02 [ ] Observed (Date ________) [ ] Potential [ ] Alleg
04 Narrative Description:

None observed and no potential exists.

01 [ ] K. Damage to Fauna 02 [ ] Observed (Date ________) [ ] Potential [ ] Alleg
04 Narrative Description:

None reported and no potential exists.

01 [ ] L. Contamination of Food Chain 02 [ ] Observed (Date ________) [ ] Potential [ ] Alleged
04 Narrative Description:

None reported and no potential exists.

01 [X] M. Unstable Containment of Wastes (Spills/Runoff/Standing liquids, Leaking drums) 02 [ ] Observed (Date ________) [X] Potential [ ] Alleg
03 Population Potentially Affected 2,327 04 Narrative Description:

Wastes deposited directly on ground. Only slag, foundry dust, concrete, wood, and household trash observed. These are all low-mobile wastes, except for leachates from the wastes.

01 [ ] N. Damage to Offsite Property 02 [ ] Observed (Date ________) [ ] Potential [ ] Alleg
04 Narrative Description:

None reported and no potential exists.

01 [ ] O. Contamination of Sewers, Storm Drains, WWTPs 02 [ ] Observed (Date ________) [ ] Potential [ ] Alleg
04 Narrative Description:

None reported and no potential exists.

01 [ ] P. Illegal/Unauthorized Dumping 02 [ ] Observed (Date ________) [X] Potential [ ] Alleged
04 Narrative Description:

Piles of slag, foundry dust, concrete, wood, and household trash are observed on site.

05 Description of Any Other Known, Potential, or Alleged Hazards

None.

III. TOTAL POPULATION POTENTIALLY AFFECTED 2,327

IV. COMMENTS

The observed wastes are non-hazardous and pose negligible threat to the surrounding population. Concentrations of polycyclic aromatic hydrocarbons are normal background for a developed area.

V. SOURCES OF INFORMATION (Cite specific references, e.g., state files, sample analysis, reports)

Site inspection.

POTENTIAL HAZARDOUS WASTE SITE SITE INSPECTION REPORT PART 4 - PERMIT AND DESCRIPTIVE INFORMATION	I. IDENTIFICATION	
	01 State NY	02 Site Number 932085B

II. PERMIT INFORMATION

01 Type of Permit Issued (Check all that apply)	02 Permit Number	03 Date Issued	04 Expiration Date	05 Comments
[ ] A. NPDES				
[ ] B. UIC				
[ ] C. AIR				
[ ] D. RCRA				
[ ] E. RCRA Interim Status				
[ ] F. SPCC Plan				
[ ] G. State (Specify)				
[ ] H. Local (Specify)				
[ ] I. Other (Specify)				
[X] J. None				

III. SITE DESCRIPTION

01 Storage Disposal (Check all that apply)	02 Amount	03 Unit of Measure	04 Treatment (Check all that apply)	05 Other
[ ] A. Surface Impoundment			[ ] A. Incineration	[X] A. Buildings On Site
[ ] B. Piles			[ ] B. Underground Injection	
[ ] C. Drums, Above Ground			[ ] C. Chemical/Physical	
[ ] D. Tank, Above Ground			[ ] D. Biological	
[ ] E. Tank, Below Ground			[ ] E. Waste Oil Processing	
[X] F. Landfill	40,000	cubic yds.	[ ] F. Solvent Recovery	06 Area of Site
[ ] G. Landfarm			[ ] G. Other Recycling Recovery	
[ ] H. Open Dump			[ ] H. Other ______ (Specify)	10 Acres
[ ] I. Other ______ (Specify)				

07 Comments

Although the DEC registry of inactive hazardous waste disposal sites indicates that the City of Niagara Falls operated this landfill, the Niagara County Health Department has been unable to substantiate this claim. Thus this landfill can be considered to be unregulated. Volume estimate is a very rough estimate based on site inspection.

IV. CONTAINMENT

01 Containment of Wastes (Check one)

[ ] A. Adequate, Secure [ ] B. Moderate [X] C. Inadequate, Poor [ ] D. Insecure, Unsound, Dangerous

02 Description of Drums, Diking, Liners, Barriers, etc.

None

V. ACCESSIBILITY

01 Waste Easily Accessible: [X] Yes [ ] No

02 Comments:

Site is a field in a residential area

VI. SOURCES OF INFORMATION (Cite specific references, e.g., state files, sample analysis, reports)

Niagara County Health Department Memorandum, August 8, 1986 from Mike Hopkins to Larry Clare

Site Inspection

New York State Department of Environmental Conservation, Region 9, Office of Permits

POTENTIAL HAZARDOUS WASTE SITE
SITE INSPECTION REPORT

PART 5 - WATER, DEMOGRAPHIC, AND ENVIRONMENTAL DATA

I. IDENTIFICATION	
01 State NY	02 Site Numb 932085B

II. DRINKING WATER SUPPLY

01 Type of Drinking Supply (Check as applicable)

	Surface	Well	02 Status: Endangered	Affected	Monitored
Community	A. [X]	B. [ ]	A. [ ]	B. [ ]	C. [X]
Non-community	D. [ ]	D. [ ]	D. [ ]	E. [ ]	F. [ ]

03 Distance to Site

A 2 (mi)

B ______ (r)

III. GROUNDWATER

01 Groundwater Use in Vicinity (Check one)

[ ] A. Only Source for Drinking

[X] B. Drinking (Other sources available) Commercial, Industrial, Irrigation (No other water sources available)

[ ] C. Commercial, Industrial, Irrigation (Limited other sources available)

[ ] D. Not Used, Unuseable

02 Population Served by Groundwater 8

03 Distance to Nearest Drinking Water well 3.5 (mi)

04 Depth to Groundwater 5 (ft)

05 Direction of Groundwater Flow NW and SW

06 Depth to Aquifer of Concern 20 (ft)

07 Potential Yield of Aquifer Unknown (gpd)

08 Sole Source Aquifer [ ] Yes [X]

09 Description of Wells (Including usage, depth, and location relative to population and buildings)

NUS Corporation, an EPA contractor, operates five monitoring wells on site - four in the southeast corner of the site, and one USGS well in the northwest corner of the site. Twenty-three other monitoring wells are within four blocks and are also monitored by NUS.

10 Recharge Area

[X] Yes

[ ] No

Comments: Precipitation recharges aquifer.

11 Discharge Area

[ ] Yes

[X] No

Comments:

IV. SURFACE WATER

01 Surface Water (Check one)

[X] A. Reservoir Recreation Drinking Water Source

[ ] B. Irrigation Economically Important Resources

[ ] C. Commercial, Industrial

[ ] D. Not Current Used

02 Affected/Potentially Affected Bodies of Water

Name:	Affected	Distance to Site
Niagara River - Tonawanda (East) Channel	[ ]	1 (mi)
	[ ]	(mi)
	[ ]	(mi)

V. DEMOGRAPHIC AND PROPERTY INFORMATION

01 Total Population Within

One (1) Mile of Site	Two (2) Miles of Site	Three (3) Miles of Site
A. 2,327 No. of Persons	B. 29,281 No. of Persons	C. 72,288 No. of Persons

02 Distance to Nearest Population 0 (mi)

03 Number of Buildings Within Two (2) Miles of Site 10,975

04 Distance to Nearest Off-Site Building 0 (mi)

05 Population Within Vicinity of Site (Provide narrative description of nature of population within vicinity of site, e.g., rural, village, densely populated urban area)

There are four two-family homes located within the boundaries of the study area in the southwest portion of the site. There are also homes south and west of the site for several blocks.

POTENTIAL HAZARDOUS WASTE SITE
SITE INSPECTION REPORT

PART 5 - WATER, DEMOGRAPHIC, AND ENVIRONMENTAL DATA

I. IDENTIFICATION	
01 State NY	02 Site Number 932085B

VI. ENVIRONMENTAL INFORMATION

01 Permeability of Unsaturated Zone (Check one)

[ ] A. 10^{-6} - 10^{-8} cm/sec [X] B. 10^{-4} - 10^{-6} cm/sec [ ] C. 10^{-4} - 10^{-3} cm/sec [ ] D. Greater Than 10^{-3} cm/sec

02 Permeability of Bedrock (Check one)

[ ] A. Impermeable (Less than 10^{-6} cm/sec) [ ] B. Relatively Impermeable (10^{-4} - 10^{-6} cm/sec) [X] C. Relatively Permeable (10^{-2} - 10^{-4} cm/sec) [ ] D. Very Permeable (Greater than 10^{-2} cm/sec)

03 Depth to Bedrock	04 Depth of Contaminated Soil Zone	05 Soil pH
20 (ft)	Unknown (ft)	Unknown

06 Net Precipitation	07 One Year 24-Hour Rainfall	08 Slope: Site Slope	Direction of Site Slope	Terrain Average Slope
3 (in)	2 (in)	0 %	N.A.	<1 %

09 Flood Potential

Site is in None Year Floodplain

10

[ ] Site is on Barrier Island, Coastal High Hazard Area, Riverine Floodway

11 Distance to Wetlands (5 acre minimum)

ESTUARINE	OTHER
A. NA (mi)	B. 0.5 (mi)

12 Distance to Critical Habitat (of Endangered Species)

______ (mi)

Endangered Species: None

13 Land Use in Vicinity

Distance to:

COMMERCIAL/INDUSTRIAL	RESIDENTIAL AREAS, NATIONAL/STATE PARKS, FORESTS, OR WILDLIFE RESERVES	AGRICULTURAL LANDS: PRIME AG LAND	AGRICULTURAL LANDS: AG LAND
A. 0 (mi)	B. 0 (mi)	C. >3 (mi)	D. >3 (mi)

14 Description of Site in Relation to Surrounding Topography

The site is essentially flat, although there are some shallow depressions and mounds on the lot. The Russo Chevrolet auto dealership owns a large building on the eastern part of the site. Townhouses are built on the southwestern portion of the site and businesses are located on site along 61st Street and Niagara Falls Blvd. The surrounding area is a flat lacustrine plain. Interstate 190 embankment is about 200 feet east of the site, and the CECOS waste management facility is located about 1,000 yards to the north.

VII. SOURCES OF INFORMATION (Cite specific references, e.g., state files, sample analysis, reports)

Johnston, R.H., Groundwater in the Niagara Falls Area, New York, 1964, NY Conservation Department, Bulletin GW-53
Higgins, B.A., et al., Soil Survey of Niagara County, New York, 1972, USDA Soil Conservation Service
USGS topographical maps, 7.5', Niagara Falls and Tonawanda West quadrangles
NYSDEC Region 9, Departments of Wetlands and Wildlife
GEMS Geographical Exposure Modeling System

POTENTIAL HAZARDOUS WASTE SITE
SITE INSPECTION REPORT

PART 6 - SAMPLE AND FIELD INFORMATION

I. IDENTIFICATION

01 State	02 Site Number
NY	932085B

II. SAMPLES TAKEN

Sample Type	01 Number of Samples Taken	02 Samples Sent to	03 Estimated Date Results Availab
Groundwater			
Surface Water			
Waste			
Air			
Runoff			
Spill			
Soil			
Vegetation			
Other			

III. FIELD MEASUREMENTS TAKEN

01 Type	02 Comments
Air Monitoring with PID gas/ vapor analyzer	No readings over background

IV. PHOTOGRAPHS AND MAPS

01 Type [X] Ground [ ] Aerial

02 In Custody of E & E, Buffalo, New York
(Name of organization or individual)

03 Maps
[X] Yes
[ ] No

04 Location of Maps
E & E, Buffalo, New York

V. OTHER FIELD DATA COLLECTED (Provide narrative description of sampling activities)

None

VI. SOURCES OF INFORMATION (Cite specific references, e.g., state files, sample analysis, reports)

Site Inspection

D16 3

POTENTIAL HAZARDOUS WASTE SITE
SITE INSPECTION REPORT

PART 7 - OWNER INFORMATION

I. IDENTIFICATION	
01 State	02 Site Number
NY	932085B

II. CURRENT OWNER(S)			PARENT COMPANY (If applicable)		
01 Name Russo Chevrolet	02 D+B Number		08 Name	09 D+B Number	
03 Street Address (P.O. Box, RFD #, etc.) Chevy Place	04 SIC Code		10 Street Address (P.O. Box, RFD #, etc.)	11 SIC Code	
05 City Niagara Falls	06 State NY	07 Zip Code	12 City	13 State	14 Zip Code
01 Name Sam Russo	02 D+B Number		08 Name	09 D+B Number	
03 Street Address (P.O. Box, RFD #, etc.) Chevy Place	04 SIC Code		10 Street Address (P.O. Box, RFD #, etc.)	11 SIC Code	
05 City Niagara Falls	06 State NY	07 Zip Code	12 City	13 State	14 Zip Code
01 Name Rose Ann E. Spalling	02 D+B Number		08 Name	09 D+B Number	
03 Street Address (P.O. Box, RFD #, etc.) 61st Street	04 SIC Code		10 Street Address (P.O. Box, RFD #, etc.)	11 SIC Code	
05 City Niagara Falls	06 State NY	07 Zip Code	12 City	13 State	14 Zip Code
01 Name Wallace and Betty Blake	02 D+B Number		08 Name	09 D+B Number	
03 Street Address (P.O. Box, RFD #, etc.) 61st Street	04 SIC Code		10 Street Address (P.O. Box, RFD #, etc.)	11 SIC Code	
05 City Niagara Falls	06 State NY	07 Zip Code	12 City	13 State	14 Zip Code
01 Name H.S. Mye Lumber Corp.	02 D+B Number		01 Name	02 D+B Number	
03 Street Address (P.O. Box, RFD #, etc.) 61st Street	04 SIC Code		03 Street Address (P.O. Box, RFD #, etc.)	04 SIC Code	
05 City Niagara Falls	06 State NY	07 Zip Code	05 City	06 State	07 Zip Code
01 Name Oldsway Auto Leasing, Inc.	02 D+B Number		01 Name	02 D+B Number	
03 Street Address (P.O. Box, RFD #, etc.) 61st Street	04 SIC Code		03 Street Address (P.O. Box, RFD #, etc.)	04 SIC Code	
05 City Niagara Falls	06 State NY	07 Zip Code	05 City	06 State	07 Zip Code

III. PREVIOUS OWNER(S) (List most recent first)			IV. REALTY OWNER(S) (If applicable, list most recent first)		
01 Name	02 D+B Number		01 Name	02 D+B Number	
03 Street Address (P.O. Box, RFD #, etc.)	04 SIC Code		03 Street Address (P.O. Box, RFD #, etc.)	04 SIC Code	
05 City	06 State	07 Zip Code	05 City	06 State	07 Zip Code

V. SOURCES OF INFORMATION (Cite specific references, e.g., state files, sample analysis, reports)

Draft Profile Report, 64th Street South, Paul Dicky, Niagara County Health Department

POTENTIAL HAZARDOUS WASTE SITE SITE INSPECTION REPORT PART 8 - OPERATOR INFORMATION	I. IDENTIFICATION 01 State: NY 02 Site Numb[er]: 932085B

II. CURRENT OPERATOR (Provide if different from owner)				OPERATOR'S PARENT COMPANY (If applicable)		
01 Name None		02 D+B Number		10 Name		11 D+B Number
03 Street Address (P.O. Box, RFD #, etc.)		04 SIC Code		12 Street Address (P.O. Box, RFD #, etc.)		13 SIC Code
05 City	06 State	07 Zip Code		14 City	15 State	16 Zip Code
08 Years of Operation	09 Name of Owner					

III. PREVIOUS OPERATOR(s) (List most recent first; provide only if different from owner)				PREVIOUS OPERATORS' PARENT COMPANIES (If applicable)		
01 Name Unknown		02 D+B Number		10 Name		11 D+B Number
03 Street Address (P.O. Box, RFD #, etc.)		04 SIC Code		12 Street Address (P.O. Box, RFD #, etc.)		13 SIC Cod[e]
05 City	06 State	07 Zip Code		14 City	15 State	16 Zip Code
08 Years of Operation	09 Name of Owner During This Period					
01 Name		02 D+B Number		10 Name		11 D+B Number
03 Street Address (P.O. Box, RFD #, etc.)		04 SIC Code		12 Street Address (P.O. Box, RFD #, etc.)		13 SIC Cod[e]
05 City	06 State	07 Zip Code		14 City	15 State	16 Zip Code
08 Years of Operation	09 Name of Owner During This Period					
01 Name		02 D+B Number		10 Name		11 D+B Number
03 Street Address (P.O. Box, RFD #, etc.)		04 SIC Code		12 Street Address (P.O. Box, RFD #, etc.)		13 SIC Coc[e]
05 City	06 State	07 Zip Code		14 City	15 State	16 Zip Code
08 Years of Operation	09 Name of Owner During This Period					

IV. SOURCES OF INFORMATION (Cite specific references, e.g., state files, sample analysis, reports)

No current operations
No previous operators registered

D16

POTENTIAL HAZARDOUS WASTE SITE
SITE INSPECTION REPORT

PART 9 - GENERATOR/TRANSPORTER INFORMATION

I. IDENTIFICATION	
01 State	02 Site Number
NY	932085B

II. ON-SITE GENERATOR

01 Name	02 D+B Number	
None		
03 Street Address (P.O. Box, RFD #, etc.)	04 SIC Code	
05 City	06 State	07 Zip Code

III. OFF-SITE GENERATOR(S)

01 Name	02 D+B Number		01 Name	02 D+B Number	
None					
03 Street Address (P.O. Box, RFD #, etc.)	04 SIC Code		03 Street Address (P.O. Box, RFD #, etc.)	04 SIC Code	
05 City	06 State	07 Zip Code	05 City	06 State	07 Zip Code
01 Name	02 D+B Number		01 Name	02 D+B Number	
03 Street Address (P.O. Box, RFD #, etc.)	04 SIC Code		03 Street Address (P.O. Box, RFD #, etc.)	04 SIC Code	
05 City	06 State	07 Zip Code	05 City	06 State	07 Zip Code

IV. TRANSPORTER(S)

01 Name	02 D+B Number		01 Name	02 D+B Number	
None					
03 Street Address (P.O. Box, RFD #, etc.)	04 SIC Code		03 Street Address (P.O. Box, RFD #, etc.)	04 SIC Code	
05 City	06 State	07 Zip Code	05 City	06 State	07 Zip Code
01 Name	02 D+B Number		01 Name	02 D+B Number	
03 Street Address (P.O. Box, RFD #, etc.)	04 SIC Code		03 Street Address (P.O. Box, RFD #, etc.)	04 SIC Code	
05 City	06 State	07 Zip Code	05 City	06 State	07 Zip Code

V. SOURCES OF INFORMATION (Cite specific references, e.g., state files, sample analysis, reports)

Site Inspections

D162

POTENTIAL HAZARDOUS WASTE SITE
SITE INSPECTION REPORT

PART 10 - PAST RESPONSE ACTIVITIES

I. IDENTIFICATION	
01 State NY	02 Site Numbe 932085B

II. PAST RESPONSE ACTIVITIES

01 [ ] A. Water Supply Closed   02 Date ________   03 Agency ________
04 Description:
None reported

01 [ ] B. Temporary Water Supply Provided   02 Date ________   03 Agency ________
04 Description:
None reported

01 [ ] C. Permanent Water Supply Provided   02 Date ________   03 Agency ________
04 Description:
None reported

01 [ ] D. Spilled Material Removed   02 Date ________   03 Agency ________
04 Description:
None reported

01 [ ] E. Contaminated Soil Removed   02 Date ________   03 Agency ________
04 Description:
None reported

01 [ ] F. Waste Repackaged   02 Date ________   03 Agency ________
04 Description:
None reported

01 [ ] G. Waste Disposed Elsewhere   02 Date ________   03 Agency ________
04 Description:
None reported

01 [X] H. On Site Burial   02 Date ________   03 Agency ________
04 Description:
Some disposed waste may now be covered by other wastes or fill

01 [ ] I. In Situ Chemical Treatment   02 Date ________   03 Agency ________
04 Description:
None reported

01 [ ] J. In Situ Biological Treatment   02 Date ________   03 Agency ________
04 Description:
None reported

01 [ ] K. In Situ Physical Treatment   02 Date ________   03 Agency ________
04 Description:
None reported

01 [ ] L. Encapsulation   02 Date ________   03 Agency ________
04 Description:
None reported

01 [ ] M. Emergency Waste Treatment   02 Date ________   03 Agency ________
04 Description:
None reported

01 [ ] N. Cutoff Walls   02 Date ________   03 Agency ________
04 Description:
None reported

01 [ ] O. Emergency Diking/Surface Water Diversion   02 Date ________   03 Agency ________
04 Description:
None reported

01 [ ] P. Cutoff Trenches/Sump   02 Date ________   03 Agency ________
04 Description:
None reported

01 [ ] Q. Subsurface Cutoff Wall   02 Date ________   03 Agency ________
04 Description:
None reported

D16_3

POTENTIAL HAZARDOUS WASTE SITE
SITE INSPECTION REPORT

PART 10 - PAST RESPONSE ACTIVITIES

I. IDENTIFICATION	
01 State NY	02 Site Number 932085B

II. PAST RESPONSE ACTIVITIES (Cont.)

01 [ ] R. Barrier Walls Constructed 02 Date ______ 03 Agency ______
04 Description:
None reported

01 [ ] S. Capping/Covering 02 Date ______ 03 Agency ______
04 Description:
None reported

01 [ ] T. Bulk Tankage Repaired 02 Date ______ 03 Agency ______
04 Description:
None reported

01 [ ] U. Grout Curtain Constructed 02 Date ______ 03 Agency ______
04 Description:
Non reported

01 [ ] V. Bottom Sealed 02 Date ______ 03 Agency ______
04 Description:
None reported

01 [ ] W. Gas Control 02 Date ______ 03 Agency ______
04 Description:
None reported

01 [ ] X. Fire Control 02 Date ______ 03 Agency ______
04 Description:
None reported

01 [ ] Y. Leachate Treatment 02 Date ______ 03 Agency ______
04 Description:
None reported

01 [ ] Z. Area Evacuated 02 Date ______ 03 Agency ______
04 Description:
None reported

01 [ ] 1. Access to Site Restricted 02 Date ______ 03 Agency ______
04 Description:
None reported

01 [ ] 2. Population Relocated 02 Date ______ 03 Agency ______
04 Description:
None reported

01 [ ] 3. Other Remedial Activities 02 Date ______ 03 Agency ______
04 Description:

None reported

III. SOURCES OF INFORMATION (Cite specific references, e.g., state files, sample analysis, reports)

NYSDEC Region 9 files
NCHD files

POTENTIAL HAZARDOUS WASTE SITE SITE INSPECTION REPORT PART 11 - ENFORCEMENT INFORMATION	I. IDENTIFICATION	
	01 State NY	02 Site Number 932085B

II. ENFORCEMENT INFORMATION

01 Past Regulatory/Enforcement Action [ ] Yes [X] No

02 Description of Federal, State, Local Regulatory/Enforcement Action

III. SOURCES OF INFORMATION (Cite specific references, e.g., state files, sample analysis, reports)

NYSDEC Region 9 enforcement

D1(8

6

6. ASSESSMENT OF DATA ADEQUACY AND RECOMMENDATIONS

Extensive soil and groundwater sampling has been performed at the site by NUS. The 25 monitoring wells both on and off site and the 25 on-site biased soil samples are adequate to document contamination at this site (NUS 1986). Because PAHs and pesticides were found at the site, a Phase II investigation including continued monitoring of the groundwater wells is recommended to determine the extent of contaminations and the pathways of migration.

7. REFERENCES

Dicky, Paul, 1987, Niagara County Health Department, Draft Profile Report on 64th Street South.

Hawley, John, November 19, 1985, New York State Department of Health, Memorandum to Sandra Stanish.

Nelson, William, May 12, 1986, Public Health Advisor, Public Health Service, U.S. Department of Health and Human Services, memorandum to Mr. Steve Luflig, Deputy Director, Emergency and Remedial Response Division.

NUS Corporation, November 20, 1985, Site Inspection Report and Hazardous Ranking System Model, 64th Street Dump-South, Niagara Falls, New York, Final Draft.

NUS Corporation, October 9, 1986, Final Report and Data Presentation for the LaSalle Area Groundwater Monitoring Program, Niagara Falls, New York, for the Environmental Services Division, U.S. Environmental Protection Agency.

Russo, Joseph, Jr., June 12, 1987, personal communication during E & E site visit.

Appendices

APPENDIX A

PHOTOGRAPHIC RECORD

ecology and environment, inc.

PHOTOGRAPHIC RECORD

Client: New York State Department of Environmental Conservation   E & E Job No.: ND2031

Camera: Make Olympus OM-10   SN: 2387486

Photographer: Dennis Sutton

Date/Time: 6/12/87, 12:05

Lens: Type:

SN:

Frame No.: 12

Comments*: View of site looking north from Girard Street.

Photographer: Dennis Sutton

Date/Time: 6/12/87, 12:09

Lens: Type:

SN:

Frame No.: 13

Comments*: Visible slag onsite in southwest corner.

*Comments to include location

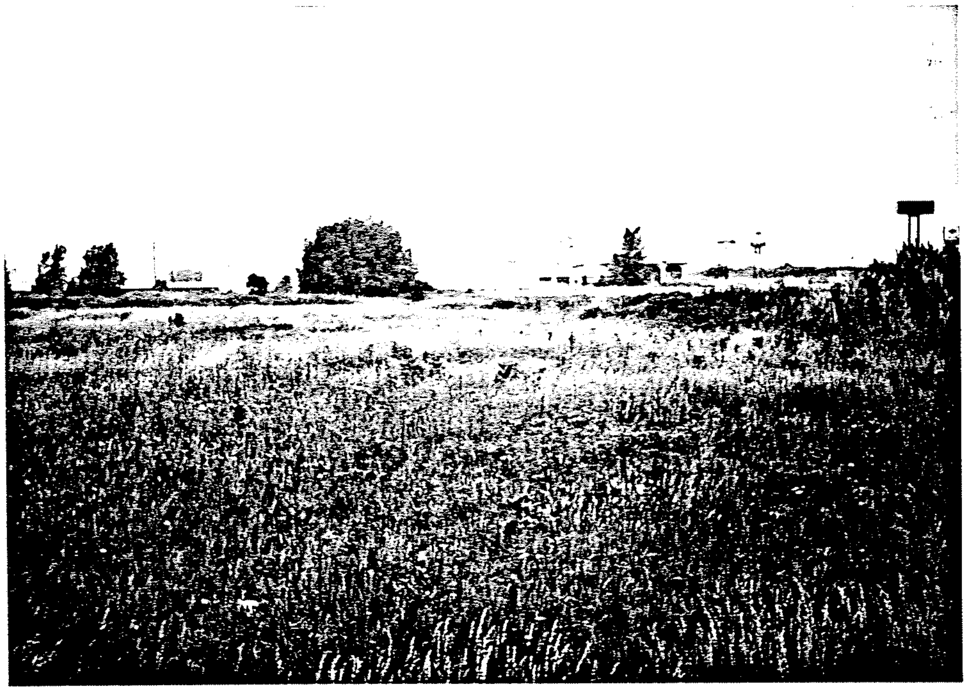
D1628

ecology and environment, inc.

PHOTOGRAPHIC RECORD

Client: New York State Department of Environmental Conservation E & E Job No.: ND2031

Camera: Make Olympus OM-10 SN: 2387486



Photographer: Dennis Sutton

Date/Time: 6/12/87, 12:20

Lens: Type:

SN:

Frame No.: 14

Comments*: Slag pile observed in southwest corner of site.

Photographer: Dennis Sutton

Date/Time: 6/12/87, 12:25

Lens: Type:

SN:

Frame No.: 15

Comments*: Slag and foundry sand found in southwest corner of site.

*Comments to include location

D1628

APPENDIX B

UPDATED NYSDEC INACTIVE
HAZARDOUS WASTE DISPOSAL SITE
REGISTRY FORM

NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION
DIVISION OF SOLID AND HAZARDOUS WASTE

INACTIVE HAZARDOUS WASTE DISPOSAL SITE REPORT

Priority Code: 2a Site Code: 932085B

Name of Site: 64th Street South Region: 9

Street Address: Chevy Place between Pine Avenue and Girard Avenue

Town/City: Niagara Falls County: Niagara

Name of Current Owner of Site: Several owners

Address of Current Owner of Site: Several owners

Type of Site: [ ] Open Dump [ ] Structure [ ] Lagoon
[X] Landfill [ ] Treatment Pond

Estimated Size: 10 acre(s)

Site Description:

This area includes 10 acres on the south of Niagara Falls Boulevard. Prior to landfilling, this area was farmland. It was used as a landfill during the 1950s and possibly the 1960s. Domestic and commercial wastes are suspected to be the principal wastes, although some industrial dumping occurred also. During 1985, EPA contractors conducted a boring/sampling program at this site. Polycyclic aromatic hydrocarbons were found at concentrations typical of developed areas. Phthalates and pesticides were found but were judged not to pose a threat by the New York State Department of Health.

Hazardous Waste Disposed: [ ] Confirmed [X] Suspected

Type and Quantity of Hazardous Wastes Disposed:

Type	Quantity (Pounds, Drums, Tons, Gallons)
None known	

Time Period Site was Used for Hazardous Waste Disposal:

______________, 19 50 To early, 19 60s

Owner(s) During Period of Use: Unknown

Site Operator During Period of Use: Unknown

Address of Site Operator: NA

Analytical Data Available: [ ] Air [ ] Surface Water [X] Groundwater
[X] Soil [ ] Sediment [ ] None

Contravention of Standards: [ ] Groundwater [ ] Drinking Water
[ ] Surface Water [ ] Air

Soil Type: Odessa - Lakemont - Ovid Association

Depth to Groundwater Table: 18 feet

Legal Action: Type: None [ ] State [ ] Federal

Status: [ ] In Progress [ ] Completed

Remedial Action: [ ] Proposed [ ] Under Design
[ ] In Progress [ ] Completed

Nature of Action: ______________

Assessment of Environmental Problems:

Negligible public hazard

Assessment of Health Problems:

Negligible public hazard

Person(s) Completing This Form:

NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION	NEW YORK STATE DEPARTMENT OF HEALTH
Name:	Name:
Title:	Title:
Name:	Name:
Title:	Title:
Date:	Date:

APPENDIX C

PHOTOCOPIED REFERENCES

NEW YORK STATE DEPARTMENT OF HEALTH

INTEROFFICE MEMORANDUM

TO: Sandra Stanish

FROM: John Hawley JH

DATE: November 19, 1985

SUBJECT: 64th Street Dump - South Niagara Falls

I have reviewed the letter report on the above site sent by N. Myers of NUS Corp. to D. Messina of EPA on September 5, 1985. A full evaluation of possible public health significance of soil contamination at such a site requires, first, selection of proper analytes in the data - gathering phase of the investigation. I do not know anything about previous history of the site - other than it is described as a "former disposal area" - or about the basis for selection of analytes. Although the letter and attached tables do not provide all the information needed for a full evaluation, the soil is contaminated above background levels at some places in and adjacent to the former disposal area. My initial assessment is that none of the measured contamination levels is high enough to constitute a health hazard from short-term or even continued exposure via normal playing activities. However, the site is not recommended as a play area for very small children (younger than 3 years old or so) who sometimes have a tendency to swallow quantities of dirt while playing. I see no need to fence the area.

Soil samples were analyzed for volatiles, semi-volatiles, pesticides/PCBs, and inorganics (metals). The only volatiles found are methylene chloride and acetone, which appear to be the result of contamination of samples or equipment during cleaning. The principal semi-volatiles found are polycyclic aromatic hydrocarbon compounds (PAHs), which were found at the surface at every sampling site. These compounds are very common throughout the environment, being formed in the combustion of wood, petroleum products and the like. The levels found at the site are comparable to total PAH levels found by various investigators in areas such as fields adjacent to highways (see references). The relative abundance of individual PAH compounds in the one sample result I examined on this basis was consistent with that found by Blumer et al (1977) in soil near a highway in a town in the mountains of Switzerland. At three sampling sites on the area identified as the former disposal area, PAHs were found at all depths sampled. At one of these sites (NYA1-S7), which also was identified as being "in a shallow trench," the PAH level was six to 50 times greater than at any other site, although the level was still well within the range found in the other studies. The sample location map indicates this site to be between a gas station and Russo Chevrolet. As such it could represent additional contamination by activities at these places.

The other semi-volatile contaminant found is bis (2-ethylhexyl) phthalate. This is a compound used in a great variety of products, including many plastics. It was found in soil five feet below the surface at two sampling sites in the former disposal area (S3,S5) as well as in surface soil at one of these locations (S5) and off the designated disposal area in a swale (S11) and a shallow depression (S10). This compound has been found to be carcinogenic in an animal biossay; EPA has estimated a human cancer potency based on accepted extrapolation techniques. Using my estimates for the lifetime exposure associated with contaminated soil in a residential yard, the highest contamination level found at this site would correspond to about a one in a billion increased cancer risk if it were present throughout a residential area. On this basis none of the bis (2-ethylhexyl) phthlate levels measured appear to represent a significant health risk.

The pesticide compounds, alpha-hexachlorocyclohexane (a-HCH), beta-hexachlorocyclohexane (b-HCH), and endosulfan sulfate were found in some surface and sub-surface soil samples. [Note: the report uses the abbreviation BHC, a misnomer for the hexachlorocyclohexanes.] These levels, too, are well below those that would represent a public health hazard.

Metallic elements are natural contituents of soil Several metals were detected in the analysis for inorganic compounds. The toxicity of metallic compounds often depends on the chemical and physical properties of the particular compound rather than on the toxicity of the elemental metal. It is impossible to make such distinctions on the basis of the present data, however, since only the metal concentrations are reported in the analysis. I have compared the individual sample data to elemental composition data for eastern U.S. soils (Shacklette and Boerngen, 1984) and to other samples to detect significant deviations that may indicate contamination by a metallic compound. The data indicate elevated levels of zinc, manganese, copper, tin, and possibly chromium at some locations. Presence at five feet below the surface in the former disposal area (e.g. site S3) indicates a probable association with the disposal activity [although, as noted above, I know nothing about this purported activity]. Elevated surface concentrations at other sample locations e.g. site S7) may be indicative of surface run-off from the street or from automotive repair activities.

A summary of the data at each sample location and a list of references are attached.

JH:dm
S0039

cc: Dr. N. Kim
Mr. R. Tramontano

SUMMARY OF ANALYTICAL RESULTS BY SAMPLE SITE

Sample Site NYA1-S1

Methylene chloride - contamination

No other volatiles

Semi-volatiles:
PAHs at surface, 1,000-1,300 ppb; total 7,360 ppb

Metals:
Cr perhaps elevated at surface
Mn perhaps elevated at surface

No pesticides.

Sample Site NYA1-S2

Methylene chloride (and acetone) contamination

No other volatiles

No semi-volatiles except PAHs at surface, 700-1,900 ppb; total 11,880 ppb

No pesticides

No unusual metal levels

Sample Site NYA1-S3 (in former disposal area)

Methylene chloride - contamination

No other volatiles

No semi-volatiles except:
PAHs at all depths: up to 1,800 ppb; total 12,820 ppb
Distribution (relative abundance) consistent with that found by Blumer *et al* (1977) near a highway

Bis (2-ethylhexyl)phthalate 2,500 ppb at five foot depth

Pesticides: a-HCH below detection limit at one foot depth

Metals: Ba - possibly elevated at five foot
Cu - possibly elevated at five foot
Mn - possibly elevated at all levels
Zn - clearly elevated at five foot
Tin - clearly elevated at five foot

SUMMARY OF ANALYTICAL RESULTS BY SAMPLE SITE

Sample Site NYA1-S4 (in former disposal area)

Methylene/chloride (and acetone) contamination

No other volatiles

No semi-volatiles except:
PAHs at surface: 400 to 1,900 ppb; total 10,070 ppb

No pesticides

Metals: Mn - possibly elevated at surface
Zn - elevated at surface

Sample Site NYA1-S5 (on filled-in swale, at edge of former disposal area)

Methylene chloride (and acetone)

No other volatiles

No semi-volatiles except:
PAHs at all depths - but $C_{surf} > C_{2ft} > C_{5ft}$
Surface: 400 to 3,500 ppb; $total_{surf}$=27,340 ppb

Bis (2-ethylhexyl)phthalate at all levels
$C_{2ft} > C_{surf} = C_{5ft}$

Pesticides: 23 ppb a-HCH and 330 ppb b-HCH at surface

Metals: Cu - possibly elevated at two foot
Mn - possible elevated at surface
Zn - elevated at all levels, highest at surface

Sample Site NYA1-S6 (trench, edge of former disposal area)

Methylene chloride and acetone

No other volatiles

No semi-volatiles except:
PAHs at surface: up to 730 ppb; total 3,620 ppb

Pesticides: a-HCH and b-HCH at surface (35-40 ppb) and at five foot (13-18 ppb)

Metals: nothing exceptional

SUMMARY OF ANALYTICAL RESULTS BY SAMPLE SITE

Sample Site NYA1-S7 (trench, edge of former disposal area)

Mehylene chloride and acetone

Trichloroethylene (6.9 ppb) at two feet

Semi-volatiles:
PAHs at surface, two feet and five feet
totals: 173,00 ppb; 8,530 ppb; 890 ppb
surface level is definitely elevated

No pesticides

Metals:
Ba - possibly elevated at surface
Mn - possibly elevated at surface, decrease with depth
Zn - clearly elevated at surface, decrease with depth

Sample Site NYA1-S8 (next to manhole)

Methylene chloride and acetone

PAHs: total 6,650 ppb

Pesticides: a-HCH, 110 ppb

Metals:
Mn - possibly elevated
Zn - possibly elevated

Sample Site NYA1-S9 (swale, former disposal area)

PAHs: total 5,160 ppb

No pesticides

Metals:
Cr - elevated (160 ppb)
Mn - possibly elevated

SUMMARY OF ANALYTICAL RESULTS BY SAMPLE SITE

Sample Site NYA1-S10 (shallow depression)

Methylene chloride

PAHs: total 33,260 ppb

Bis (2-ethylhexyl)phthalate 1,800 ppb

No pesticides

Metals: Cu - elevated
Mn - elevated
Zn - elevated

Sample Site NYA1-S11 (swale)

Mehylene chloride

PAHs: total 11,410 ppb

Bis (2-ethylhexyl)phthalate 1,000 ppb

Pesticides: a-BHC below detection limit
endosulfan sulfate 180 ppb

Metals: Mn - possibly elevated
Zn - possibly elevated

JH:dm
S0040

Draft

DEPARTMENT OF HEALTH & HUMAN SERVICES

Public Health Service
Agency for Toxic Substances
and Disease Registry

Memorandum

Date · May 12, 1986

From William Nelson
Public Health Advisor

Subject Health Assessment: Niagara Falls
Groundwater Sampling Results

To Mr. Steve Luftig
Deputy Director
Emergency & Remedial Responce Division

I have reviewed the Niagara Falls groundwater sampling results with several technical experts from the Agency For Toxic Substances and Disease Registry (ATSDR) at the Centers for Disease Control in Atlanta, Georgia.

Specifically, we discussed the contaminants Cyanide and Vinyl Chloride which were discovered at levels of 904 µg/l and 100 µg/l respectively in the middle well cluster. We concluded that since the groundwater is not utilized for drinking purposes by the residents of the community that no immediate health threat exists. We further concured on your plan to do additional monitoring and attempt to locate the source of the contaminants.

New York State Department of Environmental Conservation
50 Wolf Road, Albany, New York 12233-0001

Draft

Henry G. Willia
Commissione

MAY 0 9 1986

TELEX

Mr. William J. Librizzi
Director, Office of Emergency
and Remedial Response
U.S. Environmental Protection Agency
Region II
26 Federal Plaza
New York, NY 10278

Dear Mr. Librizzi:

Re: Analytical Data Presentation for Partial Sampling of the Phase 1A Groundwater Monitoring Wells for the Investigation of Potential Point Sources of Groundwater Contamination in Niagara Falls, New York - April 25, 1986

Staff of the Division of Solid and Hazardous Waste have reviewed the data in the above referenced April 25, 1986 report, received May 2, 1986 from Mr. Stephen Luftig, of your office.

The locations and low levels of contamination stated in this report support proceeding with the original investigation plan. The United States Environmental Protection Agency (USEPA) should procede expeditiously with further sampling of well clusters MW 1, 2, and 3, in conjunction with the Phase 1B investigation plan of study, which includes installation of additional bedrock wells and wider perimeter monitoring wells in the vicinity of Girard Avenue. The hydrogeologic and groundwater quality data from this next phase of the investigation is necessary to determine the spatial extent and concentrations of groundwater contamination and to assess the potential impacts of this contamination.

It should be noted, because of the contamination found in the upper fractured bedrock zone, that careful installation of monitoring wells into the lower fractured bedrock zones is critical to eliminate the potential for cross-contamination between zones due to well construction. Also, some data was unavailable from the initial sampling of Phase 1A monitoring wells due to sample failure by QA/QC testing. We expect this problem will be remedied in future sampling of the monitoring wells.

The New York State Department of Environmental Conservation (NYSDEC) continues to support the October 25, 1988 Work Plan for Investigation of Potential Point Sources of Groundwater Contamination in Niagara Falls, New York, as being a logical and scientific approach to complete the overall task of fully characterizing the contaminant plume. The next testing should proceed from that area of Phase 1A along the probable groundwater flow paths to obtain additional accurate information on the elements of groundwater flow paths and groundwater quality in the study area. USEPA should initiate an effort to compare the groundwater contamination found in this area with historical data from potential sources identified in this area.

The NYSDEC is anxious to see responsible sources identified and appropriate corrective action implemented in a timely fashion.

Again, we stand ready to work with your office on this important matter.

Sincerely,

Norman H. Nosenchuck, P.E.
Director
Division of Solid and Hazardous Waste

cc: S. Luftig, USEPA
Dr. Huffaker, NYSDOH